COOLING IN A WARMING WORLD:
Global Markets & Policy Trends

January 2019

clasp

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Why Cooling?

We are entering a new era in which hundreds of millions of people in developing and emerging economies have the economic means to purchase air conditioners, and will therefore enjoy the benefits of cooling for the first time in human history.

In a rapidly warming world, for people living in the sweltering summers of northern India or Brazil, or in an equatorial climate such as Nigeria, air conditioning will be indispensable.

Until the 21st century, air conditioning was a luxury enjoyed by only the most affluent consumers in developing and emerging economies. According to the International Energy Agency, less than 10% of the 2.8 billion people living in the hottest parts of the world currently have an air conditioner.[1]

Without ambitious intervention, energy demand from cooling could increase six-fold by 2050,[2] with the refrigerants used in air conditioners simultaneously exacerbating global warming.[3]

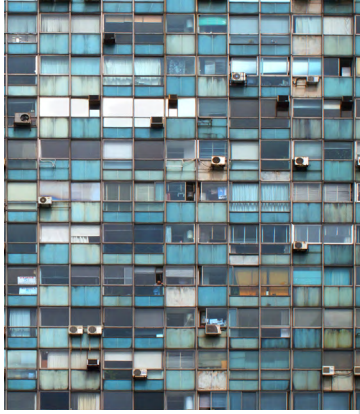
The global community is mobilizing around the cooling challenge and opportunity. The Kigali Amendment to the Montreal Protocol has the potential to save 0.5 degrees Celsius of warming from the phase out of cooling refrigerants. Cooling-related energy efficiency policies have the potential to double this, saving up to 1 degree Celsius of warming.[4]

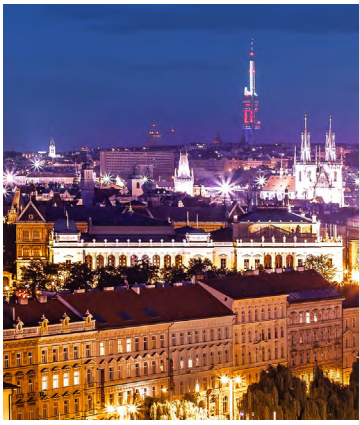
What is CLASP doing?

CLASP works around the world with a focus on cooling policy research, analysis, design, and implementation, in collaboration with our donors and expert partners.

> **Over the past year, CLASP has identified and analyzed major trends in room air conditioner markets in Africa, South America, and South and Southeast Asia.**

CLASP's 2018 cooling portfolio ranged from identifying trade and industrial policy barriers for high-efficiency air conditioners in Brazil to tracking rapid market transformation brought about by highly efficient inverter compressor technologies in India, Vietnam and Thailand. Our market and product analyses drive discussions with policymakers and other stakeholders on ambitious efficiency policies and set the stage for other market transformation programs. The case studies on recent cooling policy adoption and revision in India and Kenya contained herein, and our regional partnerships to secure savings through better policy enforcement, illustrate how timely delivery of technical expertise and policy advisory services can result in significant impact.





03 COMPLIANCE MATTERS

MARKET OUTLOOKS

Major trends in room air conditioner markets in Africa, South America, and South and Southeast Asia.

90 TWh

India's cooling-related energy demand in 2016. In 2050, demand is expected to increase to 1,350 TWh —a 15-fold increase.[1]

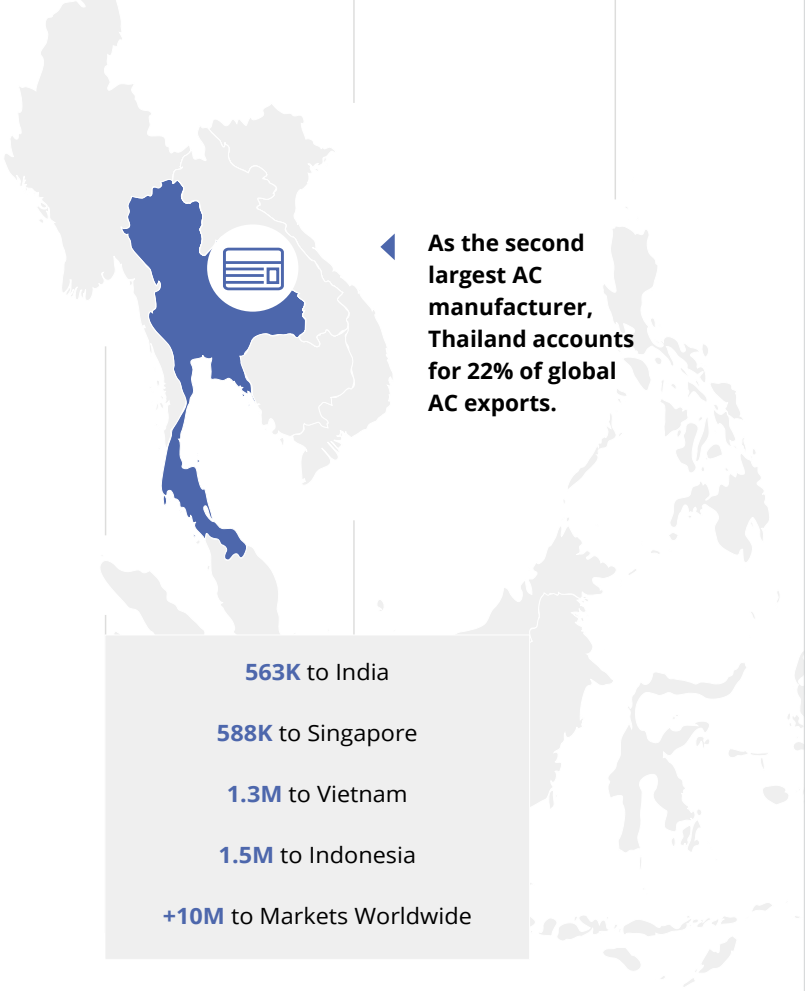
40%

In the Philippines, the average price of an inverter unit is 40% to 45% higher than a fixed-speed air conditioner.

1.7X

The best available technology in Vietnam is 1.7 times more efficient than the average air conditioner.

Southeast Asia Markets Outlook



In Southeast Asian cities with hot climates, air conditioning accounts for up to 60% of electricity demand.[5]

In 2015, under the ASEAN SHINE framework, ASEAN member states agreed to a defined minimum energy performance standard (MEPS) target for 2020, to remove the least efficient room air conditioners (ACs) from the regional market. While some member states are still developing local regulations to implement the standard, others have set MEPS well beyond the 2020 ASEAN Target.

China is the world's largest AC manufacturer, but in ASEAN only 28% of imported ACs come from China, while 68% are imported from other ASEAN countries. The vibrant regional trade in ACs in Southeast Asia is the result of tariff reform. The ASEAN Common Effective Preferential Tariff created a free trade area within ASEAN, with no tariffs on most products traded within - for ACs, the intra-ASEAN tariff is 5%, while tariffs on ACs from China and other countries are 15% and 30%, respectively. This intra-regional trade has stimulated investment in local manufacturing – Thailand is now the world's second largest AC manufacturer and exporter.

> **The domestic Thai AC market is dominated by relatively high-efficiency products.**

Thai MEPS are at an EER of 2.82 W/W, below the 2020 ASEAN Target, though all products on the market currently exceed the 2020 target. More than 70% of AC models bear Thailand's EGAT No5 label, the most efficient rating. Thailand is experiencing rapid growth in the market share of inverter ACs, which has grown from 16% to 32% since 2013. While Thailand has ambitious policies for promoting AC efficiency, Thai manufacturers and consumers have already moved past these policies to even higher efficiency products.

> **Vietnam has an imports-based market with the largest penetration of inverter ACs.**

However, the growing demand for ACs has stimulated some manufacturers to ramp up local production - there are now six domestic manufacturing facilities located in the north near Hanoi and in the south near Ho Chi Minh City. Single split ACs dominate the market, and the introduction of a seasonal performance metric in 2015 facilitated a fast transition to inverter units, with inverter market share growing from 34% to 65% since 2013. More than 60% of ACs are in the 4 or 5 star label categories, the more efficient classes. The Vietnamese market is thus primed for an increase in MEPS and a label revision.

> **Over the last five years, the Philippines AC market has experienced little improvement in efficiency.**

This is in stark contrast to other markets in Southeast Asia. While inverter market share has grown, fixed-speed window ACs still dominate the Philippines market at 62%. Local producers hold over 50% of AC market share, and inefficient small units are popular because of their low upfront cost. Slow efficiency improvement can be partially attributed to the MEPS, which have not changed since 2002 and are below the 2020 ASEAN Target. However, the availability of models with efficiencies much higher than current MEPS shows market readiness for more stringent MEPS and labeling.

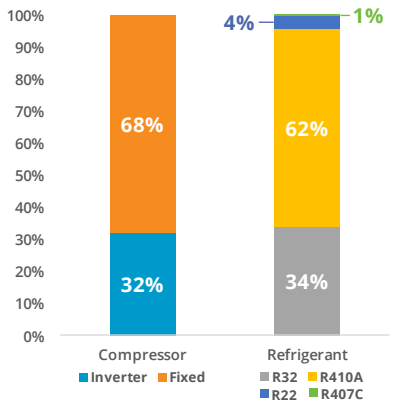
Snapshots of Southeast Asian AC Markets – Technology Type and Efficiency

AC Technology Type

Energy Efficiency Levels and Standards

Thailand

(N=2146)



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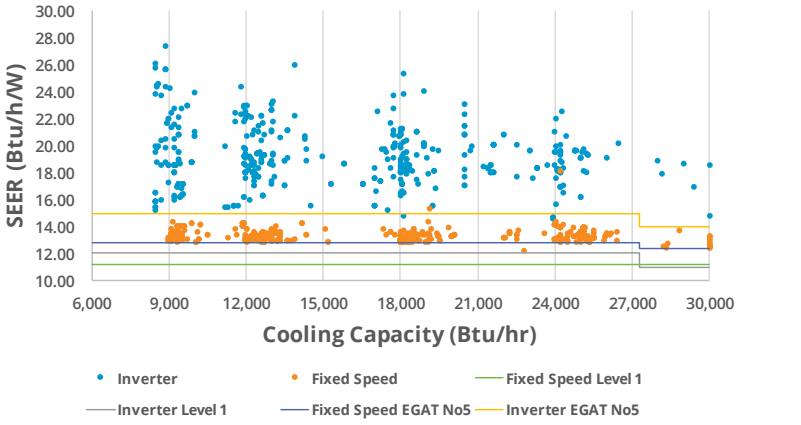

Vietnam

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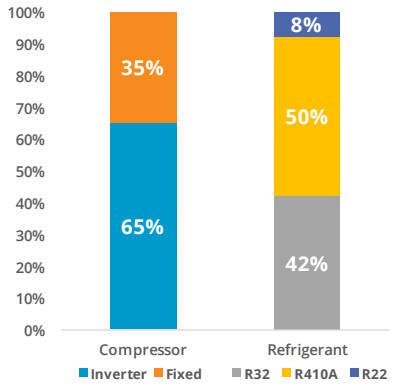

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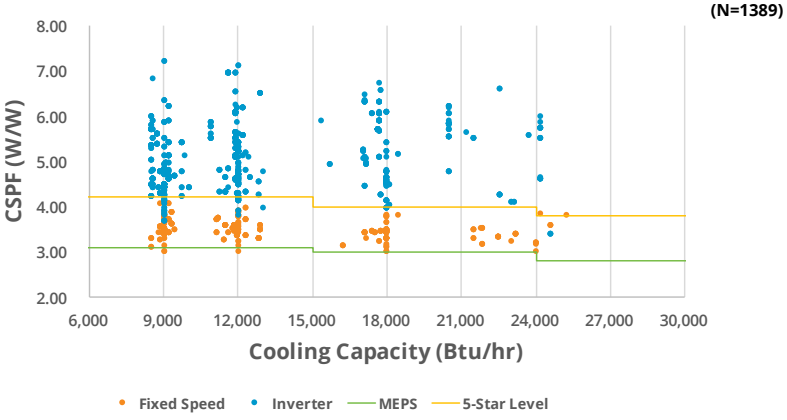

Philippines

[Read the full report]

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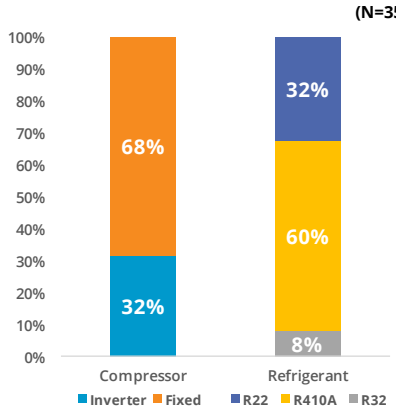

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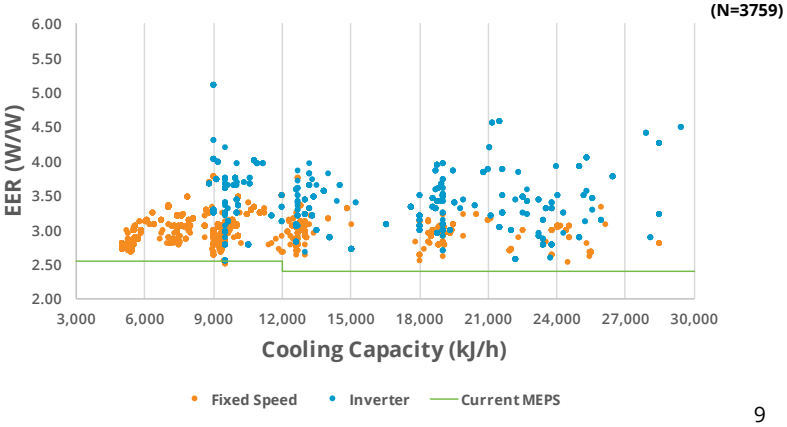


Room Air Conditioning in India

MARKET TRANSFORMATION THROUGH ENERGY EFFICIENCY POLICY

India's room AC policies transformed the market towards efficient technologies, saving 46 TWh of electricity, equivalent to 37 MT of CO_2.

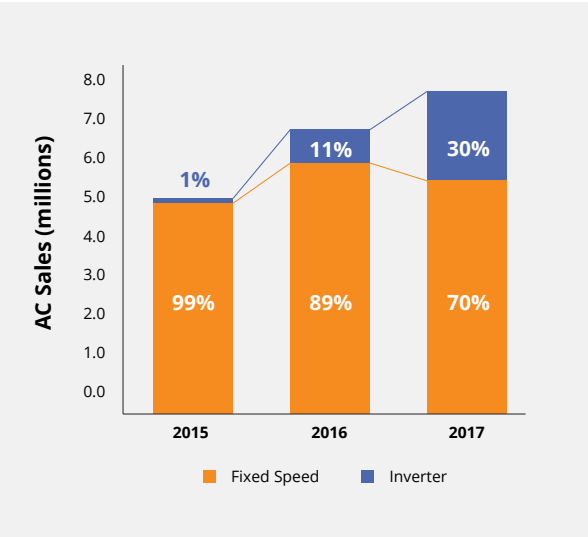
Space cooling is one of the largest drivers of energy demand in India. Aggregate nationwide cooling energy demand is expected to more than double in 2027 relative to 2017.[6]

In 2017-18, room ACs accounted for 40% of India's total energy consumption. The market is comprised of window and split ACs, accounting for 12% and 87% respectively, and 1.5 ton (or 18,000 Btu/hr) capacity ACs are the most common. Consumers prefer split ACs due to their higher efficiencies, availability at comparable prices, and aesthetics. AC penetration in Indian households is only 8%,[7] but is expected to increase exponentially over the next decade, with rising incomes, rapid urbanization, and a warming climate.

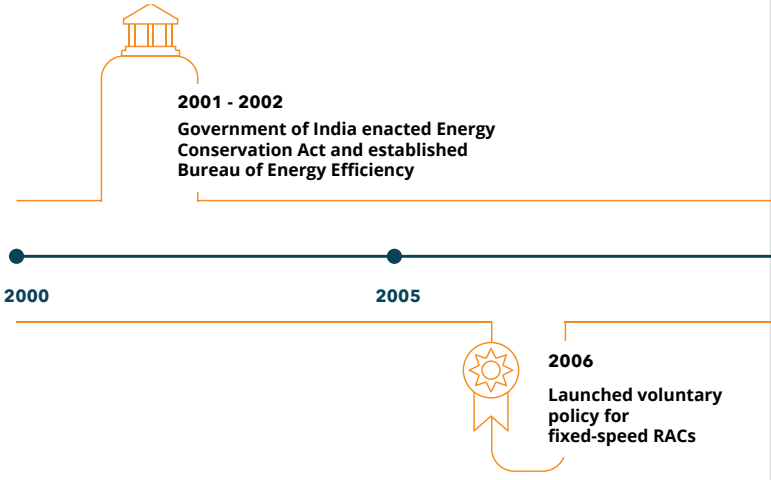
Recognizing the growth in AC ownership and associated energy demand, India's Bureau of Energy Efficiency (BEE) launched the first voluntary policy for fixed speed ACs in 2006, which became mandatory in 2009. In 2015, the policy expanded to include inverter ACs and introduced a new rating methodology called Indian Seasonal Energy Efficiency Ratio (ISEER), which factors in temperature variations across different climatic zones. In 2018, the policy for inverter ACs became mandatory and BEE developed a common rating plan for fixed and inverter ACs. BEE revises the star rating plan for room ACs biennially to increase the stringency.

CLASP and our partners support BEE's AC policy by conducting market assessments, developing test standards, and advising on policy implementation.

AC Sales and Inverter Penetration in India



Energy Efficiency Policy for Room Air Conditioners

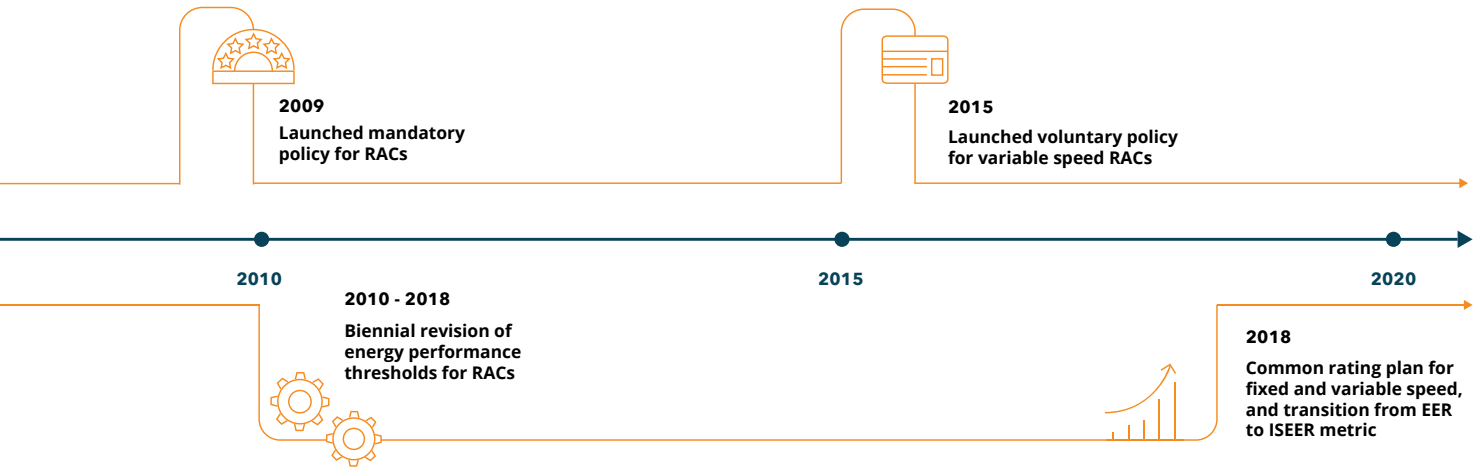


India is the first developing country to have a common rating plan for fixed and inverter ACs.

- **Inverter AC penetration increased** to 30% in 2018 as compared to less than 1% in 2015.
- **The 5-star level** of 2009 became 1-star in 2018 improving the MEPS by 35% at the 1-star level and 45% at the 5-star level.
- **The production-weighted average** EER/ISEER of ACs increased 29% from FY 2011-12 to FY 2017-18.
- **The market grew** from 0.3 million ACs in FY 2007-08 to 7.6 million in FY 2017-18, and is expected to grow further at a CAGR of 11% in the next 10 years.

Star Rating	ISEER
1-star	3.10 - 3.29
2-star	3.30 - 3.49
3-star	3.50 - 3.99
4-star	4.00 - 4.49
5-star	4.50 +

Star rating levels for fixed and variable speed ACs (valid up to Dec 2019)



Brazil's AC Compressor Market

Industrial and trade policy shape the Brazilian market more than energy efficiency policy.

In Brazil, trade and industrial policies have created a relatively isolated AC market. Complicated supply chains and low penetration of highly efficient products characterize the domestic market.

Propped up by policy

Brazil has long used its trade policy to promote domestic manufacturing by protecting Brazilian manufacturers from foreign competition through high tariffs on imported goods. ACs and AC components are included among imported products that face such high tariffs. Given the long distance between Brazil and the major AC manufacturing centers in East Asia, the high tariff costs, and the time-consuming process of achieving customs clearance, Brazil has been a challenging market for foreign AC manufacturers.

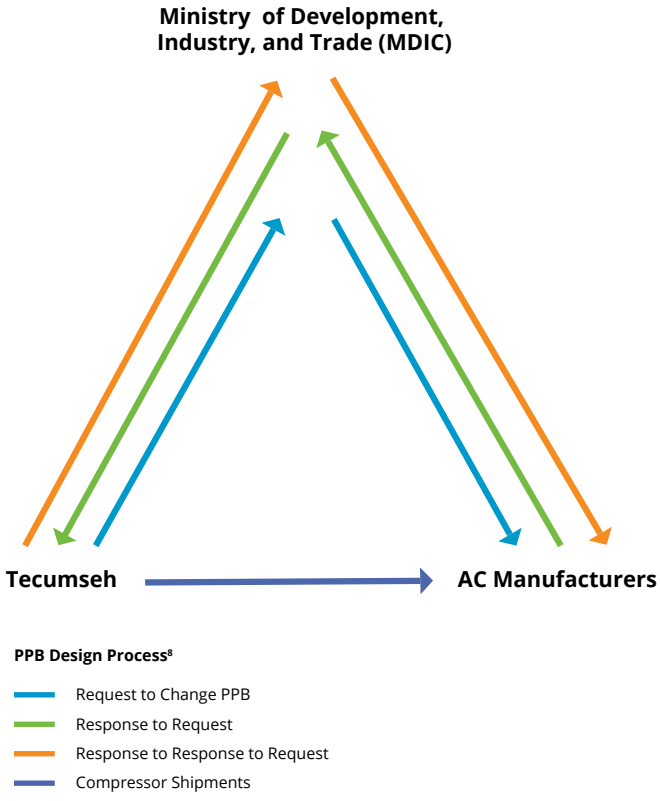
Many multinational manufacturers have set up factories in Brazil to assemble ACs using mostly imported components. These factories are all located in the Manaus Free Zone, where manufacturers receive various tax exemptions, including tariff exemptions on imported components, so long as they follow the Basic Production Process (PPB, for its initials in Portuguese). The PPB is essentially a set of local content requirements for AC assembly in the Manaus Free Zone.

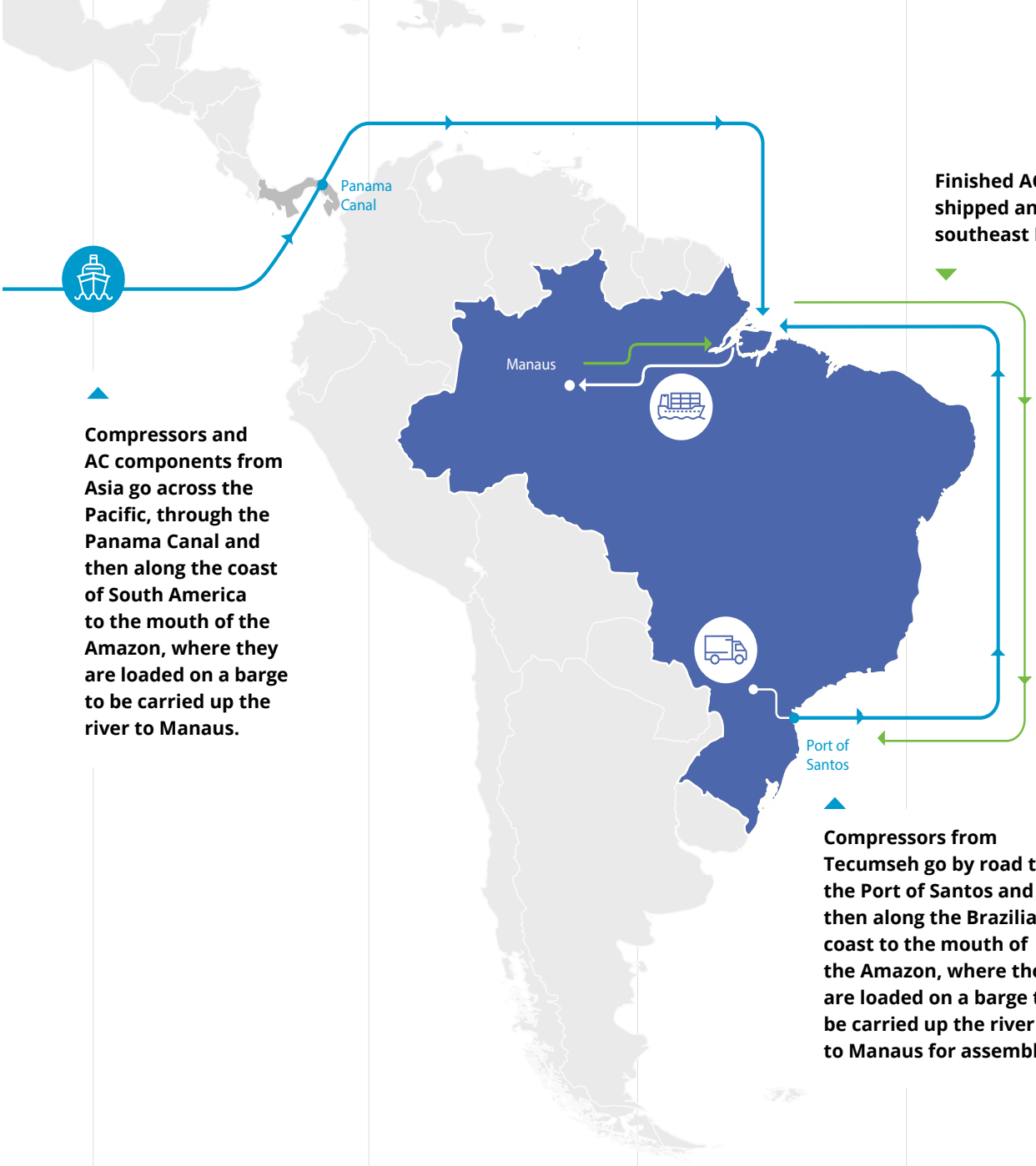
As a result of the PPB design process, a significant share of the Brazilian AC compressor market is reserved for domestic manufacturers. Currently, the only domestic manufacturer of AC compressors in Brazil is Tecumseh. Tecumseh's high value-added production process and substantial contribution to employment in Sao Carlos in Sao Paulo State matches the required goals of PPB design, such as generation of employment, local technological development, and equilibrium between regions of the country. Tecumseh only sells fixed-speed AC compressors, although they have the ability to produce inverter compressors as well.

Too far up the river

The domestic AC industry is not internationally competitive and Brazilian AC assemblers are unable to export their products, even to nearby markets such as Argentina, because of the associated logistics and production costs in Brazil. The requirements of the PPB, including both the compressor and motor requirements, disrupt AC manufacturers' well developed international supply chains for these components and replace them with more expensive domestic suppliers.

The location of AC manufacturing in Manaus, in the heart of the Amazon rainforest and approximately 1,300km up river from the coast, adds substantial costs, primarily due to complicated logistics. For example, according to Tecumseh, it costs between $1.68 and





$2.16 to ship a compressor from Shanghai to Manaus, while it costs between $1.96 and $3.33 to ship a compressor from Sao Carlos to Manaus.

The gist of the challenge

While Brazil's trade and industrial policies have been successful in their goals of developing a domestic AC industry with a significant amount of domestic value added, they have also created major distortions in the AC market. As a result, Brazilian consumers must choose from higher priced and less efficient AC units compared to other markets, and domestic AC manufacturers are unable to compete outside of Brazil's protected domestic market.

Read the full report

Snapshot of Africa's Regional AC Market

In 2017, 2.8 million room ACs were sold in Africa. Although AC market size varies from year to year, the overall trend is that of growth – between 2015 and 2016 the African AC market grew 8.3%. To provide policymakers with a better understanding of regional AC market trends, CLASP gathered information on split AC and window AC products sold via online retailers in six markets in Africa: Ghana, Kenya, Mauritius, Nigeria, South Africa, and Tunisia.

Each of the countries CLASP chose for the study meets at least one of three criteria:

- The largest economies in terms of AC demand from each region in Africa
- Countries that import all of their AC equipment (i.e. without an AC manufacturing base)
- Countries that have demonstrated leadership on integrating energy efficiency into the refrigerant transition

While each market is unique, the regional findings provide a glimpse into the state of play in African AC markets.

Read the full report

The Issue

Only ten African countries have appliance energy efficiency policies, leaving many import markets at risk of being saddled with inefficient, environmentally harmful, and poor quality ACs.

The Good News

Although the current state of the market suggests that Africa's AC market is less efficient compared to other regional markets, some manufacturers are working to upend the status quo. Daikin recently announced the launch of a new series of R-32 using inverter ACs designed specifically for the African market – these ACs can withstand a wide voltage range of 160-265V and come with condenser coils with anti-corrosion protection, to increase lifespan under corrosive environments. As more manufacturers introduce efficient ACs for African consumers, market forces may drive down prices for these products.

Current Market Characteristics

Product Type

Split units are the most popular AC type in African markets. Some countries showed a preference for products with heating and cooling functions. The most common cooling capacities are 9,000, 12,000, and 18,000 Btu/hr.

Brands

In most African markets, Chinese and South Korean brands dominate the market.

Price

Average prices for ACs with the most popular cooling capacities of 12,000 and 24,000 Btu/hr ranged from US $433-570 to US $789-960, respectively.

Compressors

The penetration of inverter technologies is low in most African countries.

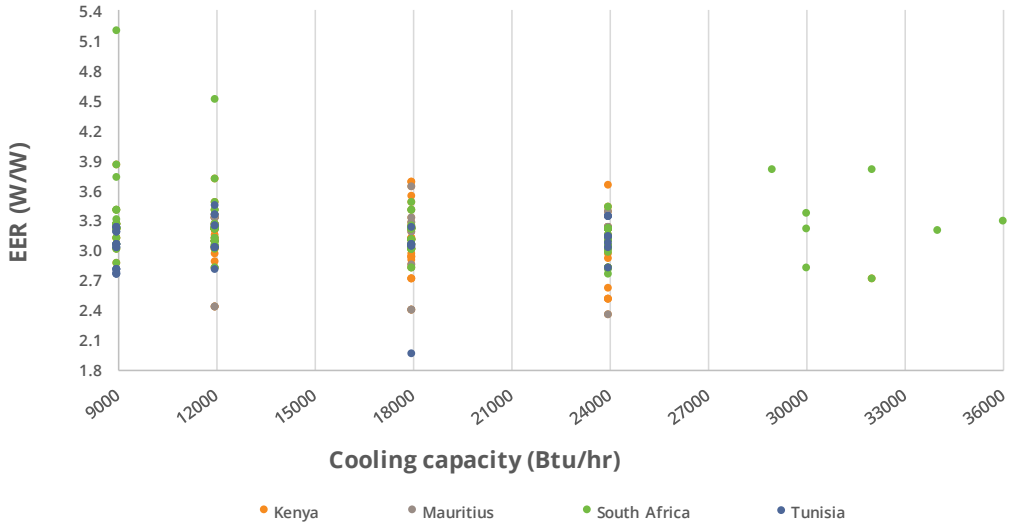
Refrigerants

ACs with the R-410A refrigerant are popular in African markets; however, ACs containing R-22 refrigerant can still be found in some African countries. R-32, the lower GWP refrigerant used in many high efficiency ACs, does not have significant market penetration.

Energy Performance

Inefficient ACs are widely available on the online African market, and most online shops do not report energy performance metrics.

The Energy Performance of ACs in Four African Markets (N=225)



80% of room AC units available in African online stores had an energy efficiency ratio (EER) between 2.8 and 3.4 W/W

Deploying the Next Generation of AC Technology

Shifting to a new generation of high-efficiency air conditioners using low global warming potential (GWP) refrigerants could reduce global greenhouse gas emissions by as much as 98 Gt of CO_2 by 2050.[7] However, achieving these greenhouse gas emissions reductions will require researching, developing, and mass-producing a new generation of air conditioners. Policymakers can help support this shift by (1) ratifying the Kigali amendment, (2) creating a clear roadmap to an AC market dominated by high-efficiency, low GWP ACs, (3) supporting research and development (R&D) for such ACs, and (4) implementing policies to ensure that new AC technologies can be safely deployed.

> **The most crucial step governments can take to move towards the next generation of ACs is to ratify the Kigali Amendment.**

The Kigali Amendment's timeline for phasing down hydrofluorocarbon (HFC) refrigerants will give manufacturers both the certainty that the entire industry will be required to shift to new technologies and the deadlines for moving to these technologies.

Policymakers can complement this step with a parallel roadmap of increasingly stringent minimum energy performance standards (MEPS) and energy efficiency label revisions. Such a roadmap would give AC manufacturers an additional policy incentive to invest in R&D for efficient ACs as well as a complementary timeline that clarifies how efficient the new technologies that replace HFC-based ACs must be.

The next crucial step that governments can take is to support research and development for new AC technologies. In particular, this support should focus on the type of high-risk, high-reward, early-stage R&D that does not typically interest manufacturers due to the low likelihood that any given potential technology will prove viable. Such R&D, which is usually conducted by universities, is required in order to produce the sort of dramatic improvements in technology that low-risk, low-reward R&D conducted by manufacturers rarely achieves. However, in order to guarantee that this R&D can lead to viable products, governments must ensure that researchers conducting early-stage R&D at universities are connected with manufacturers who can mass-produce these new technologies.

The fourth crucial step that governments can take is to support technician training and standards development for the safe handling of flammable refrigerants. This is important because all of the known replacement refrigerants for HFCs for use in room ACs are at least somewhat flammable. Ensuring that ACs using these refrigerants are safe will require skilled technicians capable of safely maintaining these ACs and safety standards that allow for the safe deployment of flammable refrigerants.

Read the full report

ACTION	RESULT
Commit to HFC phase down and ratify the Kigali Amendment to the Montreal Protocol	Sends clear signals to manufacturers that market must transition to new technologies
Strengthen MEPS for all cooling appliances, including ACs	Forces the market to move towards move inherently efficient technologies
Expand funding for early stage research and support collaboration between researchers and major manufacturers	Allows new, innovative technologies to be developed and production scaled rapidly
Create new standards for cost-competitive flammable refrigerants	Facilitate the safe adoption of low-impact, flammable refrigerants.

INTERVIEW WITH MR. ABHIJIT ACHAREKAR

General Manager (R&D) at Godrej Appliances

On Godrej's R&D on alternative refrigerants and collaboration with Indian research institutions

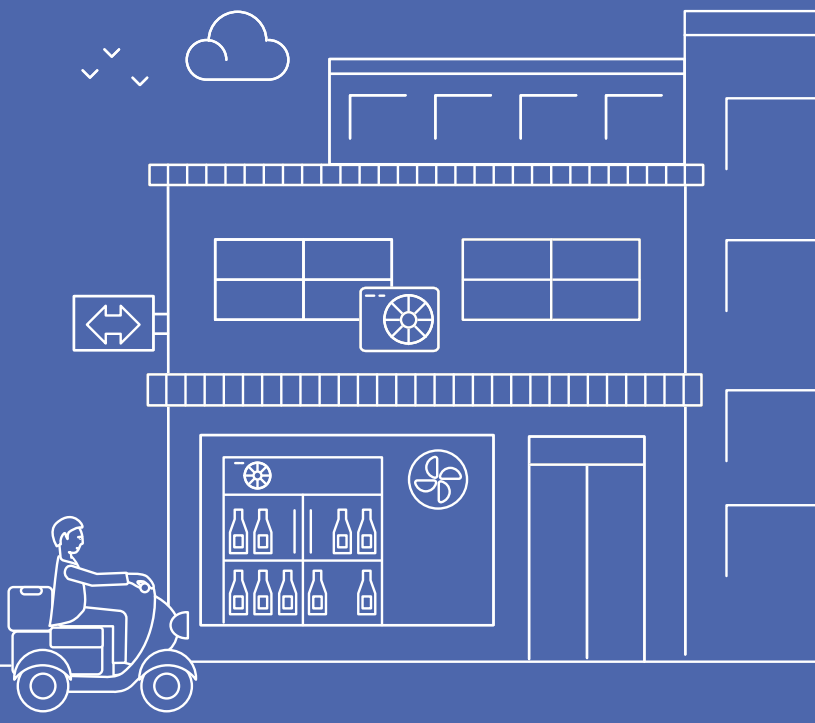
Godrej has already shifted to natural refrigerants with zero ozone depletion potential and low GWP, first for refrigerators in 2000 and then for air conditioners in 2012. We are already complying with the requirements of the Montreal Protocol, including the Kigali Amendment, as well as the Kyoto Protocol. Godrej has worked with various Indian educational and research organisations like the Indian Institutes of Technology (IITs) and the National Chemical Laboratory (NCL), among others; these interactions have been very useful in facilitating and accelerating Godrej's shift to natural refrigerants.

On national and regional readiness to move to flammable refrigerants

The Indian flammable refrigerant safety standards are being revised in line with the IEC and Godrej participates on the National Committee of Bureau of Indian Standards. In addition, Godrej has been supporting the Ministry of Environment, Forest, and Climate Change of the Government of India for technician training to handle flammable refrigerants across India since 1998. Godrej has also conducted training programs in neighbouring countries like Bangladesh and Nepal, among others, to ensure that R-290 units are serviced by adequately trained technicians.

On awareness raising on the use of ACs using low-GWP refrigerants

The Indian Star Rating scheme by the Bureau of Energy Efficiency is issuing an official energy label where Godrej R-290 ACs are in the 5-star high efficiency category. Point of sale materials, apps calculating energy savings, and media advertisements are encouraging customers to make a buying decision. Awareness is being created, but customers' selection of products is more about cost and efficiency (as shown in the star rating) than overall environmental-friendliness. The Government of India could incentivize 5-star products and environmentally friendly products with rebates and other incentives programs.



POLICY OUTLOOKS

Effective energy efficiency policy can deliver a quarter of the total carbon emissions reductions possible from a transition to highly efficient air conditioners, by removing the least efficient products form the markets. CLASP is working with policymakers in Africa, South America, and South and Southeast Asia to design and implement ambitious cooling policy to mitigate the environmental impacts from air conditioning.

4 TWh

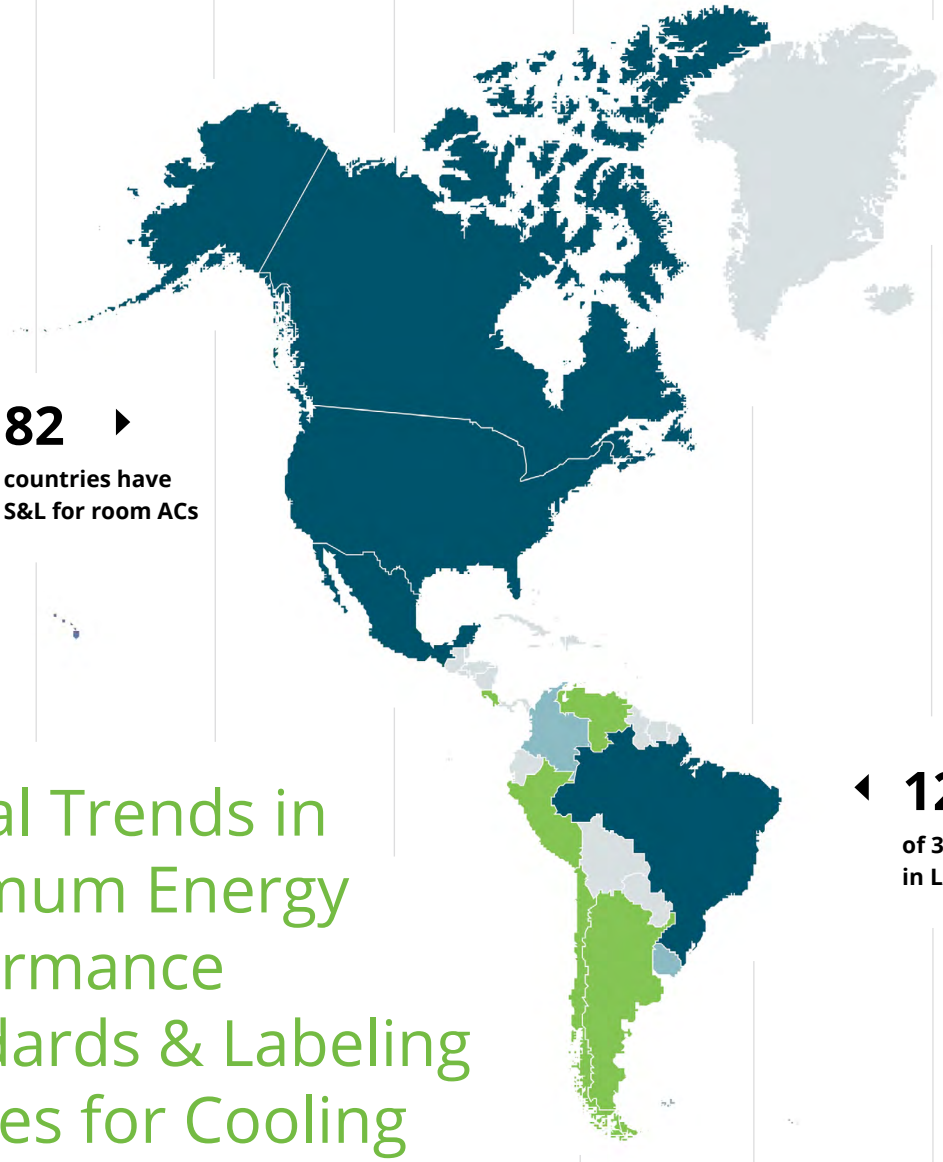
Expected electricity savings in India from the new energy efficiency policy for chillers – about 4.5% of India's cooling-related energy demand in 2016

45

Number of cooling energy efficiency policies introduced worldwide since 2007

42%

Of countries have MEPS or labels for room air conditioners



82

countries have S&L for room ACs

12

of 33 countries in LAC

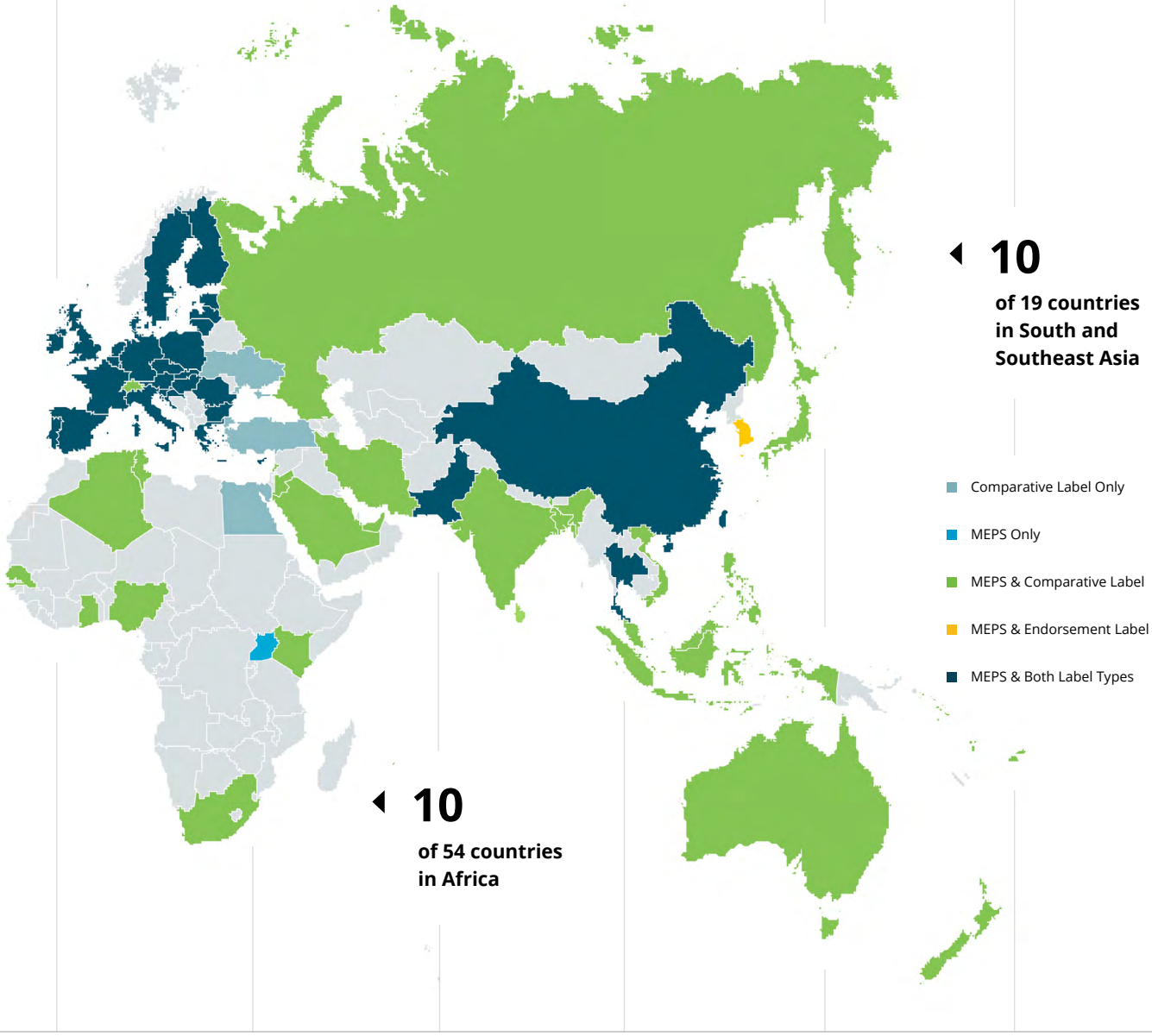
Global Trends in Minimum Energy Performance Standards & Labeling Policies for Cooling

Millions of households in developing and emerging economies - from Vietnam to Nigeria to Brazil - have the financial resources to control their indoor climate for the first time. The growing demand for space cooling is straining electrical grids around the world, resulting in rolling brown-outs and black-outs, leaving consumers in the dark or forcing them to rely on inefficient and polluting power sources, a major contributor to air pollution in urban areas of developing countries. Policymakers are turning to energy efficiency standards for air conditioners to address these challenges.

The majority of countries that have introduced cooling (AC and/or refrigeration) policies for the first time in the past ten years are located in the hottest regions of the world (West Africa, Middle East, and Latin America).

The number of cooling policies has grown steadily since they were first introduced in the late 1970's, and since 2007 there has been a sharp increase. The only other product area with similar growth is lighting – indicating that these products are driving energy demand and are currently the focus of energy efficiency policies.

Energy labels can stand alone or complement energy standards. In addition to providing information to support consumers to purchase the most efficient appliance models available, labels also provide a common energy-efficiency benchmark that makes it easier for utilities and government energy-conservation agencies to offer consumers incentives to buy energy-efficient products.



CLASP tracks three types of energy efficiency policies in the CLASP Policy Database: Standards, Comparative Labels, and Endorsement Labels. The map above shows countries that have one or more active energy efficiency policies in place.

Minimum Energy Performance Standards (MEPS) prescribe minimum efficiencies (or maximum energy consumption) that manufacturers must achieve in each and every product, specifying the energy performance but not the technology or design details of the product.

Comparative labels are affixed to manufactured products to describe their performance. They contain energy use, efficiency, or operating cost information to allow consumers to compare performance among similar products, and use either discrete categories of performance or a continuous scale.

Endorsement labels are essentially "seals of approval" given according to specified criteria.

Explore the CLASP Policy Database

Energy Efficiency Labeling Policy for Chillers in India

In 2018, on the eve of 24th World Ozone Day and the 31st anniversary of the Montreal Protocol, India announced an energy efficiency labeling policy for large commercial and industrial AC systems commonly referred to as chillers. India is one of few emerging economies to develop an energy efficiency policy for chillers, an air conditioning product that provides critical large-scale cooling to institutions like hospitals, data centers, offices, and industrial manufacturing plants.

> **In 2030, the new energy efficiency policy for chillers could save an estimated 4 TWh of electricity, equivalent to 3.5 million tons of CO_2.**

Currently, 80% of chillers in India are used for cooling in commercial buildings, while the remaining 20% are used in industrial process applications. The chiller market is projected to grow at a CAGR of 3.6%, fueled by retail, hospitality and infrastructure projects. As the number of chillers in India increases, so too will cooling related energy consumption. Chillers consume significant amounts of energy and can account for more than 40% of total energy consumption in a typical commercial building, as well as in certain industrial processes.

Energy efficiency policy for chillers is crucial to moderate future electricity demand and thereby curtail potential greenhouse gas emissions. CLASP supported BEE in formulating the chiller labeling policy and the Bureau of Indian Standards in developing a national standard for chillers that factors Indian weather and temperature conditions into energy performance ratings. Designing the new energy efficiency policy for chillers in India required an unconventional approach. Because every chiller is a customized product, CLASP and BEE collaborated with international experts in standardization, manufacturers, and test labs to develop a viable implementation process.

CHILLER POLICY PROCESS

2012
CLASP initiated a market assessment to identify opportunities for efficiency improvements

No pre-existing data

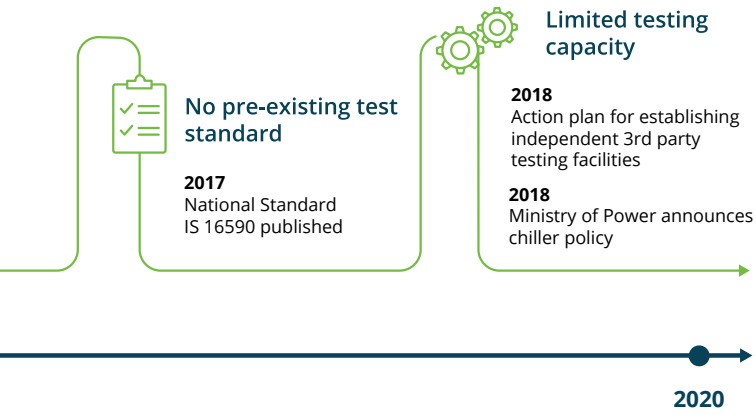
2014 - 2016
CLASP provided technical inputs and guidance to industry, BEE, and BIS. Market assessment updated

2010 — **2015**

Key features of the labeling policy

- **Effective on a voluntary basis** from September 14, 2018 through December 31, 2020, after which BEE will evaluate the policy and determine next steps.
- **The label is comparative** – chillers are rated on a scale of 1 to 5, with 5-star being the most efficient.
- **The energy efficiency thresholds** are based on the Indian Seasonal Energy Efficiency Ratio (ISEER) calculated at full load and part load conditions.
- **The labeling policy** applies to all types and capacities under the scope of Indian Standard IS 16590: 2017 Water-cooled Chilling Packages Using the Vapour Compression Cycle– Specification.

View the full schedule of the labeling policy



INTERVIEW WITH MR. ABHAY BAKRE

Director General, Bureau of Energy Efficiency (BEE)

What prompted BEE to undertake the development of a labeling program for chillers?

In accordance with the mandate conferred to it under the Energy Conservation (EC) Act, 2001, BEE establishes energy efficiency benchmarks and implements policies that will reduce the carbon intensity of the economy. Indian businesses and residential consumers are now more conscious about energy efficiency of appliances and products – the savings it could bring. You will certainly find a consumer looking for a star rating on appliances they are about to buy.

> **Chillers, being energy intensive systems, are used extensively for space conditioning of buildings and for industrial process cooling applications. The size of the Indian chiller market stood at 1 million tonnes per year in 2017. Further, demand for chillers is expected to grow rapidly.**

Therefore, BEE took on an ambitious initiative to regulate energy performance of chillers and enable end users to transition towards energy efficient chillers.

(continued on page 25)

Kenya Revises Cooling Efficiency Policy, Setting the Stage for the East African Community

Kenya, an economic leader in the East African Community with the highest GDP per capita and strong growth, recently announced a significant revision to their MEPS for room air conditioners.

Kenya's first MEPS for room ACs went into effect in July 2017, the culmination of a seven-year development process with financial support from multilateral funds. Immediately after coming into force, the standard received calls for revision, as industry was unable to comply with standard's efficiency testing requirements, which were not well suited to the Kenyan climate. Room AC imports fell 60% in 2018 compared to the same period in 2017, following the enforcement of the standard.

In October 2018, after mobilizing and convening a Technical Committee (TC) meeting to address concerns raised by industry, the Kenya Bureau of Standards (KEBS) posted the draft revised room AC standards for public review. The TC proposed to follow international test standards for measuring performance of room ACs and to increase the MEPS level from 2.8 W/W.

Alongside the new MEPs, Kenya implemented their first domestic, consumer facing efficiency labeling program. The label, which was modelled after Ghana's 5-star categorization, will help guide purchases of ACs. Fenwicks Musonye at the ERC hopes that the label will

> **"lead to a significant reduction of the demand on the national grid, which will go a long way to free power that can be distributed to homes that are yet to be connected."**

To complement the energy efficiency policy, the Energy Regulatory Commission (ERC) designed and implemented a strong conformity assessment procedure – through pre-verification of conformity (PVOC) - to ensure that products entering the Kenyan market through regulated channels comply with energy efficiency requirements. This procedure also works as a de facto ban on the import of second hand products, as the costs to comply with the testing requirements outweigh the lower costs of importing used appliances.

KENYA POLICY PROCESS

> **The example and leadership set by Kenya could be followed by all other countries in the East African Community.**

2010
KEBS starts developing MEPS for room air conditioners

April 2013
MEPS are published for public review and comment

July 2016
Regulations effecting the MEPS and labeling requirements are published

July 2017
MEPS go into effect for all new imported products

2010 — 2015

(continued from page 23)

What are the challenges you encountered in the process? How did you address the concerns from industry?

Developing test procedures for chillers and a national accreditation framework for chiller test laboratories were the biggest challenges. The Bureau of Indian Standards (BIS) was cooperative in developing standardised test procedures in consultation with industry, and the National Accreditation Board for Testing and Calibration Laboratories (NABL) was supportive in developing a new approach for certification of chillers laboratories in the country.

What are your plans going forward for chillers? Other cooling products?

BEE plans to increase awareness and outreach on the chiller labeling program in the country through various campaigns, including electronic and print media.
We are planning to adopt a labeling program for deep freezer products, given growing demand for commercial refrigeration.

The development of room AC MEPS in Kenya is a remarkable example of a process that, despite some initial hurdles, culminated in a policy with multiple benefits to all stakeholders.

- **KEBS and ERC are securing private sector support** and building trust in their program by working with industry to facilitate implementation and compliance
- **Kenya is becoming one of the few countries in Africa** that protects consumers from inefficient, environmentally harmful, and poor quality air conditioners
- **By removing the least efficient room ACs from the market,** the expected energy savings will free up electrical grid capacity needed to achieve universal electricity access for all Kenyans by 2022

No pre-existing data

March 2018
CLASP launches first ever Kenya AC market baseline study

July 2018
MEPS and labeling goes into effect for all Kenyan retailers

Industry could not comply with policy

September 2018
Technical Committee for room ACs met to revise MEPS

October 2018
Draft revised AC MEPS are published for public review and comment

2020

2018 Policy Outlook for Southeast Asia

AC markets in Southeast Asia are ready for more ambitious energy efficiency policy.

In Thailand, Vietnam, and the Philippines, revised MEPS could bring cost-effective annual savings of 18 TWh of electricity and 12.1 MT of CO_2 emissions in 2030, accounting for approximately 11% of the global potential for carbon emission reductions from AC policy. However, there is a much larger opportunity to transform these markets by influencing consumers to purchase more efficient products. Moving these markets to best available technologies would reduce CO_2 emissions by 35 MT a year in 2030, accounting for 8% of the global potential for CO_2 emissions reductions through market transformation.

Thailand last revised its MEPS in 2010, and revised labeling requirements for inverter air conditioners in 2017 and for fixed speed units in 2015. The current MEPS stand at an EER of 2.82 W/W, though all products on the Thai market currently surpass the 2020 ASEAN Target with 72% of products attaining the top-rated EGAT No5 label. This situation points to an easy opportunity to increase MEPS and labeling requirements while eliminating the different standards for fixed speed versus inverter units. By moving to a single MEPS and a single EGAT No5 label level for all ACs, and setting these at 20% above the current levels, Thailand would save 13 TWh of electricity and 8.4 MT of CO_2 emissions. However, the greater opportunity in Thailand is in market transformation. By moving the market to the best available technology, Thailand could cost-effectively save 29 TWh of electricity and 18 MT of CO_2 emissions in 2030.

Vietnam last revised their MEPS for ACs in 2015. At CSPF 3.10 W/W, the current MEPS already surpass the 2020 ASEAN Target, at least with respect to the lower capacity split ACs which dominate the market. However, the star rating system for ACs has not kept up with the market, and is in great need of revision, as evidenced by the high proportion of 4-5 star ACs on the market. As Vietnam considers revising the MEPS once again, policymakers should prioritize rescaling the star rating system and increasing the MEPS to move the market to higher efficiencies. CLASP analyzed policy scenarios for Vietnam and found that Vietnam could save up to 2.1 TWh of electricity, equivalent to 1.9 MT of CO_2 emissions, by increasing the MEPS by 20%.

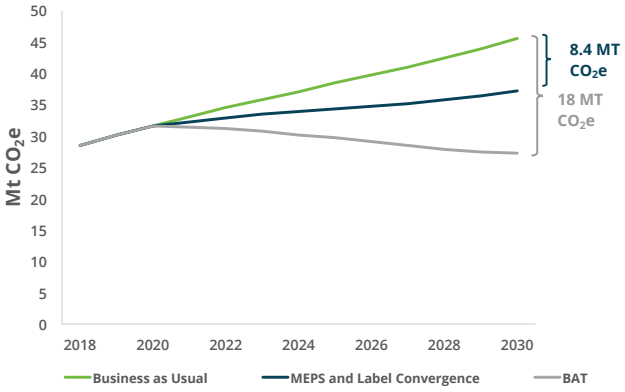
In the Philippines, the MEPS for ACs still stand at the 2002 level - EER 2.53 kJ/W-h for cooling capacities below 3.33 kW and EER 2.39 kJ/W-h for cooling capacities of 3.33 kW and above. This policy stagnation could partially explain why the room AC market, which is still dominated by fixed-speed window units, has not transformed in the same way as the other Southeast Asian markets, such as Thailand and Vietnam. On average, the efficiencies of room ACs on the market have already surpassed the 2020 ASEAN Target of 2.9 W/W. Policymakers should consider adopting more stringent MEPS – 20% above the 2020 ASEAN Target (EER 3.48 W/W) – to see the market move to efficiency levels similar to those observed in other ASEAN countries. Under this policy scenario, CLASP estimated energy savings for the Philippines at 2.6 TWh in 2030, and avoided CO_2 emissions - at 1.8 MT, or 15% of CO_2 emissions from ACs, in 2030.

Snapshots of Southeast Asian AC Policy Opportunities – CO_2 Emissions Savings from Revised AC Standards

Modeled Emissions from ACs

Energy Efficiency Levels and Recommended Standards

Thailand



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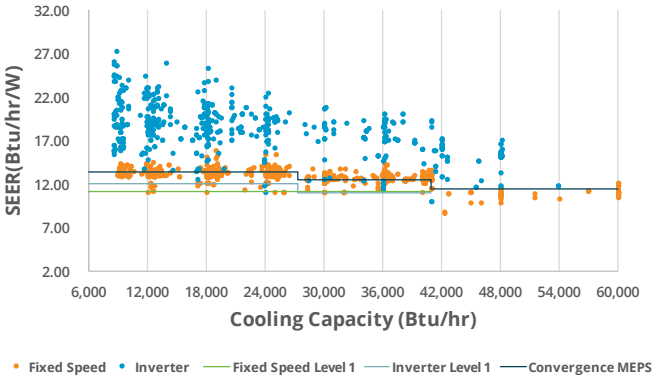
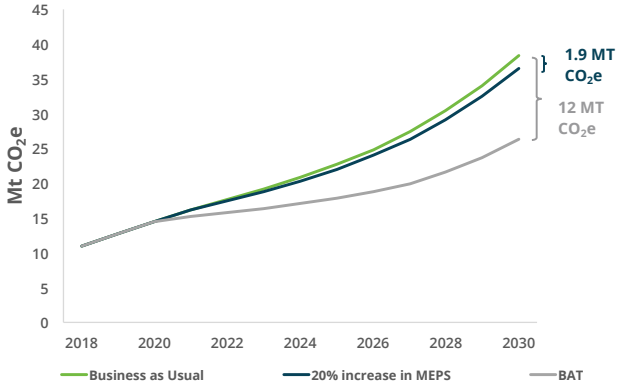


Vietnam



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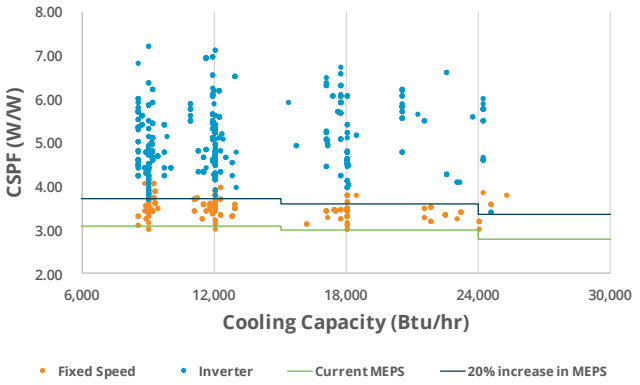
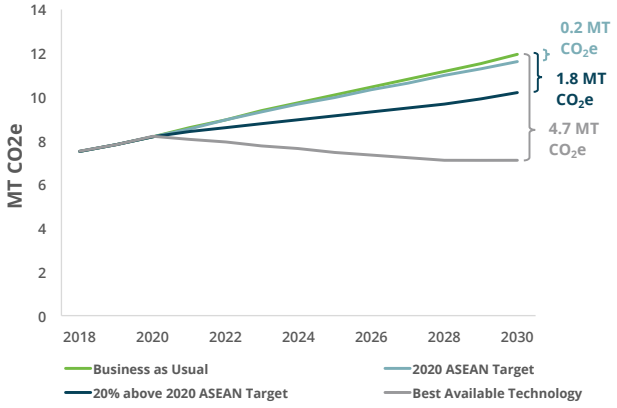


Phillipines

[Read the full report]



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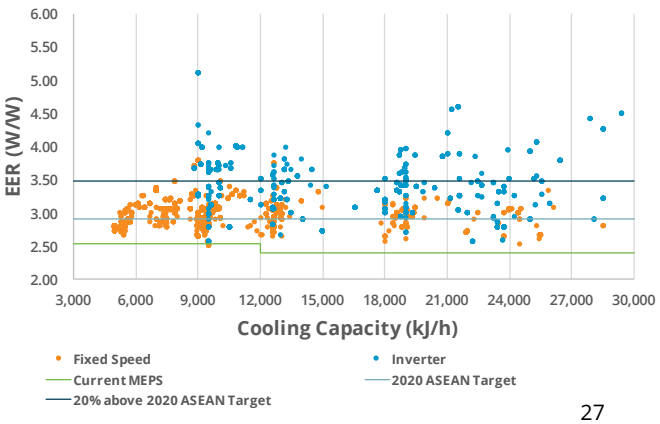


COMPLIANCE MATTERS

CLASP works with policymakers and other stakeholders in Southeast Asia and Africa to strengthen and prioritize compliance programs for cooling products. Compliance policies safeguard energy savings and other benefits of energy efficiency policies by ensuring products meet standards & labeling requirements and live up to their energy efficiency claims.

2 out of 15

ECOWAS Member States run full compliance programs

4 out of 10

ASEAN Member States run full compliance programs

5 ASEAN states

with national compliance efforts supported by CLASP

Compliance: Critical to Successful Standards and Labeling Policies

Countries can only realize the benefits of efficient and clean cooling technologies if there are systems in place to effectively implement and enforce cooling policy.

Setting ambitious cooling standards in Southeast Asia and Africa will help curb the energy and environmental impacts from air conditioning, transform markets, and improve lives. Throughout 2018, CLASP focused on supporting and strengthening regional and national compliance programs in the Association of Southeast Asian Nations (ASEAN), the Lower Mekong region, and the Economic Community of West African States (ECOWAS).

Strategic compliance frameworks are critical to safeguard benefits of appliance energy efficiency policy including projected energy savings and CO_2 emissions reductions. They also protect consumers, and create a fair playing field for suppliers of efficient and high-quality products.

Robust, cost-effective compliance frameworks protect markets from products that do not meet national standards by preventing low quality products from entering the market or removing them from the market through three key steps:

1. **Conformity Assessment** involves evaluating products before market entry through product testing, certification, registration of compliant products in national or regional databases, and checking that imported products comply with national requirements at customs.
2. **Market Surveillance** helps identify non-compliant products on the market through in-store and online monitoring of products and their labels, verification testing to prove (non-)compliance, and reporting of test results.
3. **Enforcement** corrects and discourages non-compliance, by assessing the severity of cases, taking appropriate and proportionate enforcement action, and communicating as needed to deter future offenses.

Learn more about compliance best practices.

Strengthening Compliance for Air Conditioners in Southeast Asia

ASEAN member states have made great strides towards adopting harmonized test methods and implementing regional MEPS. Driven by increasingly stringent national MEPS, AC markets in Thailand and Vietnam have transformed towards more efficient technologies. Meanwhile, the Philippines has yet to adopt the less stringent 2020 ASEAN Target. Standards adoption alone is not enough to safeguard the energy efficiency policy benefits for ACs estimated at 18.0 TWh of energy savings and 12.1 MT of avoided CO_2 emissions.

Due to a lack of appropriate frameworks, scarce resources, and ongoing policy changes, some ASEAN members have not prioritized cooling standards enforcement. With support through the Lower Mekong Initiative and the **Kigali Cooling Efficiency Program,** CLASP works closely with policymakers, testing bodies and implementing authorities to build up compliance capacity across Southeast Asia.

National compliance programs have limited reach and resources to verify that the growing number of ACs on the market actually meet the MEPS. Regional collaboration and coordination between compliance authorities can help countries with limited resources target more products and learn valuable lessons from their neighbors. CLASP empowers ASEAN countries to implement cost-effective and impactful compliance efforts by:

- **Bringing stakeholders together** to discuss best practice compliance interventions and strategic planning, particularly for market surveillance; and
- **Exploring regional collaboration opportunities** to maximize reach of individual compliance programs and accelerate standards implementation across ASEAN, in line with the goals of the **ASEAN Center for Energy.**

Guiding Market Surveillance Strategies in ASEAN

CLASP developed the *Market Surveillance for Air Conditioners: Voluntary Guidelines for ASEAN Member States,* with support from the **Lower Mekong Initiative.** These Guidelines provide best practices for conducting market surveillance for MEPS and energy labeling requirements for residential ACs. The Guidelines serve as a much needed practical resource for Southeast Asian governments and compliance authorities to follow when designing and implementing national market surveillance programs, or when revising and strengthening existing ones. The recommendations are based on existing practices from across the region and in other countries, and are targeted to different programs depending on their size, structure, available funding, and degree of implementation. The guidelines call for:

- **A strong legislative foundation,** comprehensive administrative guidelines, and a budget proportional to market needs to establish and run effective market surveillance.
- **Risk-based market surveillance activities** so that resource constrained compliance authorities can make an impact within their budgets
- **Cost-effective verification testing** to target products with greater risk of non-compliance, and well-documented processes to secure evidence and prove non-compliance.
- **Regional collaboration and coordination** to strengthen ASEAN Member States national compliance programs.

ASEAN Member States will discuss formal endorsement of the Guidelines later this year, after which they can serve as a practical tool to amplify both regional and national compliance.

Building Testing Capacity Cost-Effectively

Testing serves a vital role in appliance energy efficiency programs. Test reports from accredited third-party laboratories provide regulators with confidence that products perform as claimed and meet relevant cooling standards, so they can be certified and registered under national standards and labeling programs. Testing products that are already on the market alerts compliance authorities to cases of non-compliance.

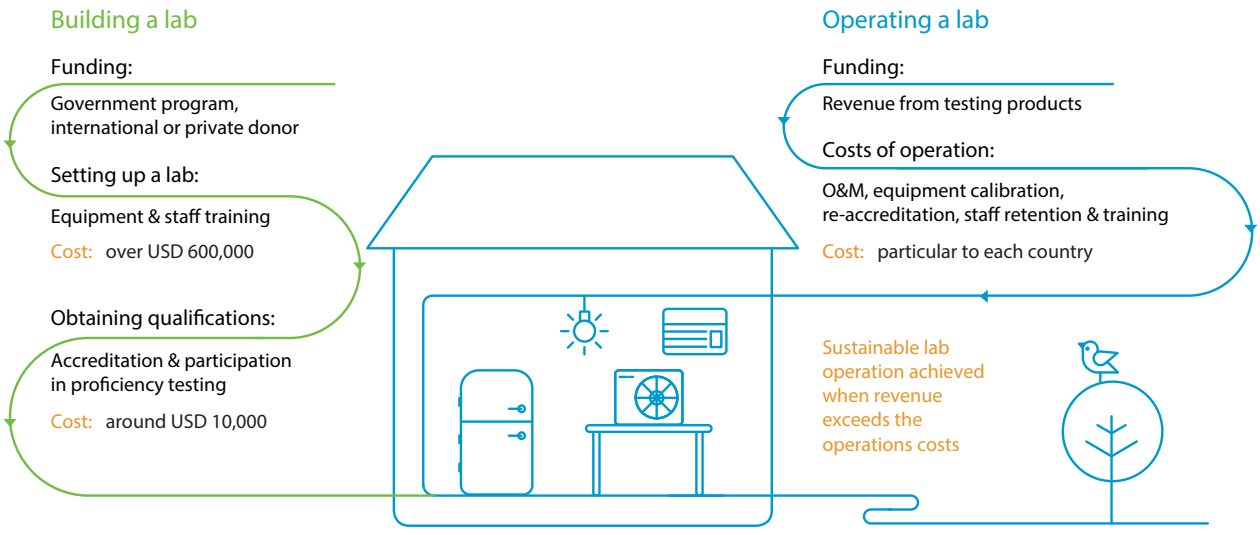
Product testing is costly and building a testing laboratory is expensive. Increasingly, policymakers are prioritizing building national or government-owned testing laboratories in support of new S&L programs under the assumption that this testing infrastructure is critical to their compliance efforts. However, a laboratory may not generate sufficient revenue to "pay for itself", and may hinder compliance efforts if not well-planned. Building a strong business case should be the first step towards establishing a national laboratory.

CLASP, on behalf of the Super-Efficient Equipment and Appliance Deployment (SEAD) Initiative, collected hard to access data on testing costs to help governments evaluate where and how to test products and make better-informed decisions to allocate their limited resources.[9]

The up-front investment into a refrigerator or AC testing laboratory can exceed USD 600,000. In addition to high upfront costs, continuous funding for staff training, equipment calibration, and re-accreditation is required to sustain a competent laboratory. When there is little demand for product testing, the underutilization of a facility can result in operational costs surpassing the revenues generated from testing. Product testing prices can vary highly from one country to the other, and depend on factors such as test method, type of product tested, and accreditation. Indicative prices for testing ACs range from USD 350 in Asia at a national laboratory to USD 11,100 in the EU at an accredited private-sector laboratory.

Alternative solutions to establishing a new test facility, such as outsourcing testing needs to private or foreign test laboratories, may be more cost-effective, especially for market surveillance efforts. Setting up mutual recognition agreements (MRAs), which recognize verification test results between countries, can save money for countries that import most of their products. Through projects in the ECOWAS and ASEAN regions, CLASP supports policymakers and regional efforts to enhance testing capacities and streamline resources for effective S&L programs.

Building and sustainably operating an AC laboratory



Accelerating Adoption and Implementation of Regional Cooling Standards in West Africa

In line with their mandate to develop harmonized standards and conformity assessment procedures to reduce barriers to trade, ECOWAS recently adopted regional energy efficiency standards for room ACs (ECOSTAND 07-2). The standards have already been adopted or adapted in several countries, but there has been no regional framework or guidance for implementation.

With harmonization of standards, labels and testing already under way in the ECOWAS region, there is an opportunity to build compliance capacity and integrate best practice early on. National compliance frameworks can be established and strengthened through regional collaboration and coordination, especially where standards are aligned and products are sold across borders. Even countries that are not currently implementing appliance energy efficiency policies can guard their markets from inefficient cooling products.

Regional compliance initiatives reduce the burden of conformity and verification testing at the national level, as authorities can work together to identify non-compliant products, allowing for targeted market surveillance activities and strategic allocation of resources.

CLASP is partnering with the ECOWAS Center for Renewable Energy and Energy Efficiency (ECREEE) to accelerate implementation and enforcement of the regional cooling standards across West African States by supporting a regional compliance program for cooling products. CLASP is building a regional product database, advising on improving regional testing capacity, and offering training for national compliance practitioners.

GHANA'S PRODUCT DATABASE

Kofi Agyarko, Director, Renewable Energy and Energy Efficiency, Energy Commission

In Ghana, the Energy Commission has developed a database to capture product and energy efficiency information for all registered appliances, including ACs. Importers and retailers are required to demonstrate compliance with relevant MEPS before their products are added to the database.

Regulators use the database to check compliance of products on the market. A new mobile app allows consumers to quickly check if a product is compliant, facilitating more informed purchasing decisions. The app also shows each product's energy efficiency rating, energy consumption in kWh and Ghanaian Cedis, and a list of nearby shops offering the product.

The database informs the Top 10 list of the most efficient refrigerating appliances. The Top 10 list has been effective at incentivizing merchants to apply the energy label to their products and driving retailers to list products on the database.

> **"The database we have created can also serve the appliance market in the sub-region. We have noticed a trend where major importers of refrigerating appliances and air-conditioners based in Ghana also sell their products in neighboring countries still bearing the Ghana Energy Efficiency Labels. This shows potential for our database to be expanded and used in other countries."**

WHAT'S NEXT IN 2019

OUR COMMITMENT

We are committed to being part of the solution in the development and deployment of highly efficient, environmentally friendly cooling on a global scale. The stakes could not be higher for the fate of human development and the global climate in the 21st century.

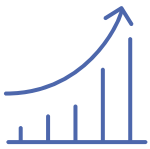
LOOKING FORWARD

GLOBAL POLICY FOCUS

CLASP will deepen and expand support for ambitious cooling policy development and implementation in major developing and emerging economies in Africa, Asia, and Latin America, while continuing to disseminate research on the evolution of cooling product markets and policies.

POLICY COMPLIANCE

We will hone in on reinforcing regional and national compliance in ASEAN, ECOWAS, and Kenya – bringing a much-needed comprehensive approach to enforcement.



ADVANCING TECHNOLOGIES & MARKETS

We are engaged in cutting edge research and analysis on international supply chains and trade policies affecting cooling product markets, advances in cooling product labeling to encompass refrigerants, and the overall environmental impact of air conditioners.

CLASP works hand-in-hand with policymakers, governments, technical experts, industry and others in the supply chain, donor organizations, consumers and consumer groups, and other stakeholders to develop and lead markets towards the highest-quality, lowest resource-intensive products.

"Room air conditioning alone will account for 20 – 40% of the world's remaining carbon budget.[10] Stringent policy measures are highly effective at transforming markets, and we must accelerate the pace of adoption to deal with this urgent global environmental challenge."

Eric Gibbs,
Chief Policy & Analysis Officer of CLASP

"Climate change is perhaps the challenge of our time. Inefficient and unsustainable cooling represents a major but addressable 'piece of the puzzle.' CLASP is proud to be part of a broad community of experts, governments, and philanthropies turning knowledge into actions and creating smart solutions to the climate crisis, now."

Christine Egan,
CEO of CLASP

Featured Publications

Africa Air Conditioner Market Scoping Study
August 2018

Global Appliance Testing Costs Catalogue
Publication forthcoming in 2019

Next Generation Residential Air Conditioners: Technologies, Barriers to Market, and Policy Options
September 2018

Philippines Room Air Conditioner Market Assessment and Policy Options Analysis
January 2019

Thailand Room Air Conditioner Market Assessment and Policy Options Analysis
Publication forthcoming in 2019

Vietnam Room Air Conditioner Market Assessment and Policy Options Analysis
Publication forthcoming in 2019

Technical and Economic Feasibility Study for a High Efficiency Compressor Market in Brazil
November 2018

Explore more in the CLASP Publication Library

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