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Pathways to prevent environmental dumping of climate-harming room air conditioners in Latin America and the Caribbean

CLIMATE & CLEAN AIR COALITION

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Authors
Lina Kelpsaite, CLASP
Vivian Cox, CLASP
Marin Rosen, CLASP
Lorena Miranda, CLASP

Designer of publication
Kerry Nash

Contact
CLASP
publications@clasp.ngo

Climate and Clean Air Coalition
secretariat@ccacoalition.org

Glossary

Access gap: The lack of access to safe, reliable, and sustainable cooling solutions, including air conditioning. Globally, the gap disproportionately affects vulnerable communities, including women and lower- and middle-income households.

Ambitious efficiency policy: The minimum energy performance standard (MEPS) levels set by governments that meet or exceed the global benchmark level used in this report.

Carbon dioxide equivalent (CO_2e): A standardized unit that measures the impact of various greenhouse gases on climate change, allowing comparison based on their global warming potential.

Cooling degree days (CDDs): The number of days that cooling is needed over a given period, based on the assumption that when the outside temperature is 18 °C (65 °F) or lower, cooling is not needed for comfort.

Cooling seasonal performance factor (CSPF): A metric that measures air conditioner efficiency over the entire cooling season, accounting for real-life variations and partial-load conditions. It is calculated by dividing the total annual amount of heat removed from indoor air during active cooling by the total annual energy consumed over that period. This is typically expressed in watt-hours per watt-hour (Wh/Wh) or watts per watt (W/W).

Direct emissions: Emissions from refrigerants, estimated based on refrigerant type and leakage rate.

Discount rate: The rate of return used to determine the present value of future cash flows to account for the time value of money and investment risk.

Electricity cost: The amount consumers pay to access and use electricity over a given period.

Electricity price: The monetary cost per unit of electrical energy that consumers pay to use electricity. This is typically expressed in amount of money per kilowatt-hour (kWh).

Energy efficiency ratio (EER): A non-seasonal metric that assesses air conditioner efficiency at a single full-load condition and does not account for partial-load performance or seasonal variation. This is typically expressed in Wh/Wh or W/W.

Environmental dumping: The practice of exporting new cooling equipment (e.g., room air conditioner [room AC] units) or technology (i.e., components of cooling equipment, such as the compressors used in room ACs) that either: 1) cannot be sold legally in the exporting country due to the enforcement of performance or other standards, or 2) cannot be used in the exporting country because the refrigerant is no longer available due to existing controls under the Montreal Protocol on Substances that Deplete the Ozone Layer ("Montreal Protocol").

Global benchmark level: The minimum energy performance standard (MEPS) threshold used to define low-efficiency units in this report. This level of efficiency corresponds to best practice recommendations by United for Efficiency (U4E) in its model regulations for air conditioners and aligns with China's room air conditioner MEPS, which are currently among the highest in the world.

Global Warming Potential (GWP): A metric used to measure the relative global warming effects of different gases over a given period. The higher the value, the more a gas contributes to global warming as compared to carbon dioxide. The most common time horizon to measure global warming potential is 100 years, referenced as GWP_{100}. For the purposes of this report, GWP_{100} has been simplified to GWP.

Indirect emissions: Emissions that result from an activity but are emitted from sources owned by entities not directly associated with that activity. For room ACs, greenhouse gases released from burning fossil fuels to power those appliances are indirect emissions.

Inflation rate: The percentage increase in the average price level of goods and services in an economy over a given period (typically one year).[i]

Informal employment: Jobs that have no benefits, social protections, or legal protections.

Inverter: A technology that controls the speed of the compressor motor in air conditioners to regulate the temperature more efficiently.

Lifecycle cost: The total cost of possessing and operating a room AC during its lifetime. This includes the initial purchase price and operating costs.

Local company: A business with operations, facilities, or assets in one country, typically the country where it is headquartered.

Low efficiency: Air conditioner efficiency levels below global benchmark level.

Low-GWP: Refrigerants with a GWP under 750 are classified as having a low-GWP.

Manufacturing (of room air conditioners): The manufacture of room air conditioning units or assembly of such units from component parts.

Minimum energy performance standard (MEPS): Regulations set by governments or regulatory bodies that specify the minimum energy efficiency levels that appliances including air conditioners must meet to be sold or used. These are among the most common forms of energy efficiency policy.

Multinational company: A corporation with operations, facilities, or assets in at least one country other than the country where it is headquartered.

Non-inverter: A traditional air conditioner compressor technology that uses an on/off method to maintain temperature, which consumes more energy and causes more temperature fluctuations than inverter technologies. Also known as a fixed-speed compressor.

Obsolete refrigerants: Refrigerants used for mechanical cooling and heating that are no longer considered viable or acceptable due to regulatory restrictions, the availability of better alternatives, or their negative environmental or safety impacts.[1]

Operating cost: Costs that consumers pay on a periodic basis to keep a room AC running. While this typically encompasses energy consumption, maintenance, and repairs, this report analyzed only operating costs associated with energy consumption.

Original equipment manufacturer (OEM): A company that makes and sells parts or products to another company, which may brand and sell the finished product to consumers.

Purchase cost: Initial cost that end consumers pay to purchase a new room AC (equipment only).

R-290: A natural hydrocarbon with the chemical formula C_3H_8 that consists entirely of propane (HC-hydrocarbon). It has an ultralow GWP_{100} of just 3.3, meaning that it is a greenhouse gas 3.3 times more potent than CO_2 over a 100-year period.

R-32: A hydrofluorocarbon (HFC) refrigerant with the chemical composition of difluoromethane, or CH_2F_2. It has a low GWP_{100}[2] of 675, meaning that it is a greenhouse gas 675 times as potent as CO_2 over a 100-year period. It is generally considered a transitional refrigerant.

R-410A: An HFC refrigerant composed of equal parts R-32 (difluoromethane, CH_2F_2) and R-125 (pentafluoroethane, CHF_2CF_3). It has a high GWP_{100} of 2,087.5, meaning that it is a greenhouse gas over 2,000 times as potent as CO_2 over a 100-year period.

Refrigerant: A fluid or gas used in cooling systems, including air conditioners, to absorb heat from one area and release it somewhere else.

Room air conditioner (room AC): Self-contained cooling systems designed to cool a single room or small area. They include window, portable, through the wall, and split types. In this report, the term refers to a split-type system.

Seasonal energy efficiency ratio (SEER): A measure of how efficiently an air conditioner cools a home over an entire cooling season, accounting for real-life variations and partial-load conditions. Consisting of the ratio of the total annual amount of heat removed from indoor air during active cooling to the total annual energy consumed over that period, it is typically expressed in British thermal units to watt-hours (Btu/Wh).

Shared responsibility: Joint importer and exporter country efforts to address environmental dumping. This concept is reflected in the Montreal Protocol Meeting of the Parties Decision XXXV/13: The import and export of prohibited cooling equipment (2023) and reports by other agencies, including the United Nations Environment Programme, General Assembly, and Energy Transitions Commission.[ii] Decision XXXV/13, in particular, recognizes that addressing the issue of imports of inefficient cooling equipment that relies on controlled substances that are no longer permitted to be placed on the market in the exporting party is a problem that requires a solution involving both importing and exporting parties.

Split system: An air conditioner or heat pump that consists of an indoor and outdoor unit. The indoor unit is mounted on the wall, floor, or ceiling. While multi-split units exist, this report covers single split air conditioners only.

1 See the working definition for obsolete refrigerants in Report of the Stop Dumping CCAC Paris Workshop (pages 2–3): https://www.ccacoalition.org/sites/default/files/resources/files/DUMPING%20ON%20AFRICA%20FINAL%20Book-updatw%202410.pdf.

2 In this report, refrigerants with a GWP under 750 are classified as having a low GWP.

Acronyms & Abbreviations

AC	Air conditioner
BAU	Business as usual
Btu	British thermal unit
CARICOM	Caribbean Community and Common Market
CC	Cooling capacity
CDDs	Cooling degree days
CO_2e	Carbon dioxide equivalent
CSPF	Cooling seasonal performance factor
EER	Energy efficiency ratio
FTZ	Free trade zone
GHG	Greenhouse gas
GWP	Global warming potential
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HPMP	HCFC phaseout management plan
HVAC	Heating, ventilation, and air conditioning
IEA	International Energy Agency
IGSD	Institute for Governance & Sustainable Development
ISO	International Organization for Standardization
KIP	Kigali Implementation Plan
kW	Kilowatt
kWh	Kilowatt hour
LAC	Latin America and the Caribbean
LCC	Lifecycle cost
LCR	Local content requirement
Mt	Megaton
MW	Megawatt
NDC	Nationally determined contributions
NOU	National ozone unit
MEPS	Minimum energy performance standard
MLF	Multilateral Fund for the implementation of the Montreal Protocol
ODS	Ozone-depleting substances
OEM	Original equipment manufacturer
SEER	Seasonal energy efficiency ratio
SICA	Central American Integration System
W/W	Watts per watt
Wh/Wh	Watt-hours per watt-hour

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Executive Summary

Photo: Donatas Dabravolskas/Adobe Stock

Report highlights

- Environmental dumping of low-efficiency room air conditioners (ACs) is common in Latin America and the Caribbean, accounting for 44% of all new unit sales.[3]
- Obsolete refrigerants are present in over a third of new room air conditioners in the region.
- Multinational and local companies alike are responsible for the environmental dumping of room ACs and the spread of obsolete refrigerants in Latin America and the Caribbean.
- There is a wide cooling access gap in the region, placing marginalized groups at higher risk of health problems and low productivity.
- Unaffordability is a key barrier to high levels of access and low-efficiency room ACs compound this challenge. However, the current lack of access presents an opportunity to ensure that the significant growth potential for room ACs is met with climate-friendly solutions.
- If the governments of all 11 countries studied adopted ambitious room AC efficiency policies,[4] they could reduce emissions by up to 173 $MtCO_2e$ by 2050—equivalent to avoiding more than 20 years' worth of emissions from over three coal-fired power plants.[5]
- Brazil has proven that increasingly stringent and periodically revised efficiency policies

3 Environmental dumping accounted for 44% of all sales in nine of the 11 focus countries. See footnote 6 for more information.

4 Ambitious efficiency policies are defined as those that set energy efficiency performance requirements for room ACs above global benchmark levels, while ambitious refrigerant policies are defined as those that accelerate the refrigerant transition to very low-GWP alternatives, like R-290. These assumptions are discussed in more detail in section 7.

5 This figure includes emissions released by three coal-fired power plants between 2027 and 2050, assuming 500 MW capacity at 50% load factor with 34% efficiency and a carbon emission factor of 95.52 kg CO_2/mmBtu, where annual emissions stay constant year-on-year.

can eliminate low-efficiency room ACs from markets.
- Grenada offers a model to accelerate the transition away from obsolete refrigerants by addressing technical, regulatory, and financial barriers through a multifaceted approach.
- Developing solutions to environmental dumping and obsolete refrigerants is a shared responsibility requiring close collaboration between importing- and exporting-country governments, the private sector, civil society, and international partners.

An in-depth analysis of the room air conditioner (room AC) market in Latin America and the Caribbean (LAC) found evidence of widespread environmentally harmful product dumping (environmental dumping), which is the practice of exporting appliances or components that cannot be legally sold in the exporting country. Approximately 44% of new room ACs sold in nine of the 11 countries[6] studied for this report constitute environmental dumping.

This report complements CLASP and the Institute for Governance & Sustainable Development's (IGSD) previous research into environmental dumping of room ACs in Africa and Southeast Asia, revealing that the practice is pervasive across the Global South. In Southeast Asia, 59% of low-efficiency room ACs sold were classified as environmental dumping in 2021, while in Africa this number reached at least 19% in 2018.

Obsolete refrigerants

The study's findings show that room ACs containing obsolete refrigerants (primarily R-410A) dominate 10 of the 11 focus countries.

The export of obsolete refrigerants is not classified as environmental dumping in this report because these refrigerants are not banned in the countries that are the primary room AC exporters to the LAC region. However, the authors included this practice in the research scope due to its significant environmental implications, as well as its relevance to the many governments in the LAC region working to meet their obligations under the Kigali Amendment to the Montreal Protocol, which aims to phase down and phase out high-global-warming potential (GWP) refrigerants.

Regional impacts of low efficiency and obsolete refrigerants in room ACs

Low-efficiency units[7] account for slightly more than half of all room AC sales in Latin America and the Caribbean. These appliances strain national electricity grids and contribute to global warming.

Absent significant changes to efficiency policy, room AC use in the region is projected to result in emissions of 1,350 $MtCO_2e$ by 2050—equivalent to emissions from nearly 30 coal-fired power plants over more than two decades.[8]

In some countries, low-efficiency room ACs also make cooling less affordable. Although these units often cost less to purchase than high-efficiency units, higher operating costs make them more expensive to use over their lifetimes. Since affordability is a major barrier to air conditioning access, this has implications for the region's cooling access gap. Reaching upwards of 50% in some countries, this access gap increases the risk of heat-related illnesses and low productivity, particularly for vulnerable groups such as low-income households and women.

Origins of environmental dumping and obsolete refrigerants

There are multiple sources of environmental dumping and obsolete refrigerants in Latin America and the Caribbean. Of all units that are considered environmental dumping, 43% were manufactured in the region by multinational companies that produce units either in their own factories or, in an arrangement found only in Argentina, through local companies with whom they have partnership agreements.

6 The 11 countries included in the study are Argentina, Barbados, Brazil, Chile, Colombia, the Dominican Republic, Grenada, Jamaica, Mexico, Panama, and Uruguay. Colombia and Uruguay were not included in the low-efficiency analysis due to incompatible efficiency metrics for the former and insufficient data for the latter.

7 Low-efficiency units are classified as those that fail to meet global benchmark efficiency levels. Additional information on global benchmark efficiency levels is available in section 2.2.

8 Assumes continuous running at 500 MW capacity at 50% load factor with 34% efficiency and a carbon emission factor of 95.52 kg CO_2/mmBtu, where annual emissions stay constant year-on-year.

The remaining 57% of units considered environmental dumping are imported. The vast majority of these (80%) are manufactured in China, but many of the companies that sell them are headquartered outside China, in countries such as Mexico, Panama, the Republic of Korea, and the United States. Only 15% of the imported low-efficiency room AC units manufactured in China are made by companies headquartered in that country.

Most room AC units with obsolete refrigerants (primarily R-410A) sold in the region are imported; these comprise 78% of all room AC imports. R-410A also dominates local production in Argentina; 92% of locally produced units sold in the country contain the refrigerant.

In Brazil, most local production has transitioned to R-32, a low-GWP refrigerant. Ninety-five percent of the country's available units in 2025 contained R-32.

Solutions to the environmental dumping of low-efficiency room ACs and the sale of room ACs with obsolete refrigerants

Ambitious national appliance efficiency policy is an effective solution for environmental dumping. Importantly, such policies are most effective when they are harmonized both regionally and between importing and exporting countries.

For refrigerants, ambitious national policies, combined with complementary governmental actions addressing relevant institutional, technical, and logistical challenges, can accelerate the transition toward environmentally friendly options.

Brazil demonstrates the effectiveness of efficiency policy in preventing environmental dumping. After the government revised its room AC efficiency policies in 2020, the market share of room ACs using energy-efficient inverter technology in the nation jumped by 35% within four years. Non-inverter units are expected to disappear from the market entirely following a planned 2026 efficiency policy revision.

Grenada offers a regional model for transitioning from obsolete refrigerants. By promoting technician training, raising awareness of ultralow-GWP refrigerant R-290, and developing a national code of practice for refrigerant handling and safety requirements, the government has successfully encouraged the use of ultralow-GWP refrigerants. In 2023, 10% of room ACs contained R-290; by 2028, this figure is expected to reach 65%. No other country in the region is expected to have an R-290 market
share over 5% in 2028.

If all 11 countries analyzed in the study adopted ambitious efficiency and refrigerant policies, they would prevent nearly 173 $MtCO_2e$ in emissions (equivalent to avoiding emissions from over three coal-fired power plants in the region for more than 20 years) and save consumers over $105 million USD in energy costs by 2050.

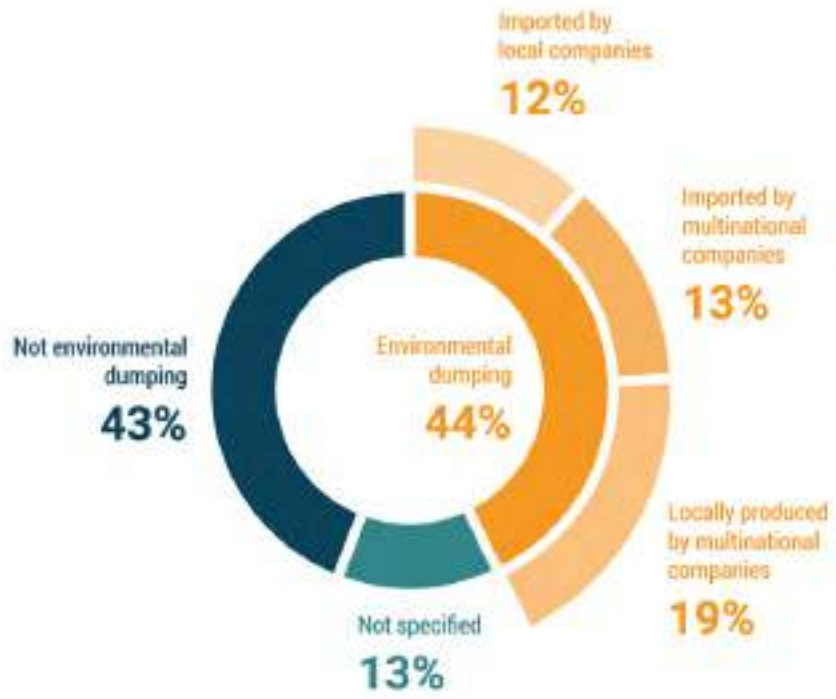
Despite this enormous potential, the efficiency and refrigerant policies of individual countries cannot eliminate environmental dumping and obsolete refrigerants on their own. Overcoming these challenges is a shared responsibility requiring close collaboration between governments, the private sector, civil society, and international partners. In particular, coordinated efforts by policymakers in importing countries in Latin America and major exporting countries such as China and the Republic of Korea present significant opportunities to identify potential actions to address the environmental dumping of room ACs globally. These actions are also expected to cultivate strong drivers for green development of the global room AC industry.

Photo: Fernando Luiz Costa de Souza/CLASP

01 Key findings

This study assesses the extent of environmental dumping of new room air conditioners (room ACs) in Latin America and the Caribbean (LAC) and explores this practice's linkages to cooling access and affordability there. It also examines the current state of the room AC market and energy efficiency policies in the region. Covering 11 countries (Argentina, Barbados, Brazil, Chile, Colombia, the Dominican Republic, Grenada, Jamaica, Mexico, Panama, and Uruguay), the analysis relies on room AC data from 2023 and 2025.

Figure 1: Environmental dumping in nine countries and its sources



Forty-four percent of all units sold in the focus countries in 2023 are classified as environmental dumping. Of these, 13% were imported by multinational companies, 12% were imported by local companies, and 19% were locally manufactured by multinational companies. (Source: CLASP analysis)

1.1 Environmental dumping is common

Environmental dumping[9] is the practice of exporting new cooling equipment (e.g., room AC units) or technology (i.e., components of cooling equipment, such as the compressors used in room ACs) that either:

1. cannot be sold legally in the exporting country due to the enforcement of performance or other standards, or
2. cannot be used in the exporting country because the refrigerant is no longer available due to existing controls under the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol).[iii]

9 For the purposes of this study, environmental dumping refers to the legal importation of new cooling equipment that meets the definition above; it does not encompass illegal importation or that of used equipment.

Photo: NikD90/Shutterstock

This analysis found that approximately 44% of all room ACs sold in nine of the 11 focus countries[10] in 2023 are considered environmental dumping, as their declared performance fails to meet exporting country standards.

Where do room air conditioners that are considered environmental dumping come from?

Units that were identified as arising from environmental dumping were manufactured both locally and abroad by multinational companies that have the ability to manufacture efficient room ACs. Those manufactured abroad were imported into LAC countries both by local companies that sell them as rebranded products and by multinational companies that sell them under their own brands (Figure 1).

Imported units classified as environmental dumping

Twenty-five percent of room AC sales in the LAC region were low-efficiency units imported from other countries; these fall into the category of environmental dumping. Approximately half of these (comprising 13% of the total market) were imported by local subsidiaries of multinational companies that are headquartered mainly in China, the United States, and the Republic of Korea, or by multinational companies working with local distributors. The remaining half of the units imported into the LAC region (comprising 12% of the total market) were imported and sold by LAC-headquartered companies that contract with multinational companies in other countries (primarily China) to manufacture room ACs based on the local companies' designs, specifications, and brand identities. These multinational companies are commonly referred to as original equipment manufacturers, or OEMs.[iv] The local companies then sell the units domestically under their own names.

Eighty-one percent of all room ACs imported into nine of the 11 focus countries were manufactured in China, either by multinational companies that sell units under their own brands or by OEMs. Of this group, only 20% met the global benchmark efficiency level in 2023, meaning that the remaining 80% of imports are considered environmental dumping.

Locally manufactured low-efficiency units classified as environmental dumping

Low-efficiency room ACs were also manufactured[11] locally in Argentina and Brazil. About 19% of all sales in the focus countries (Figure 1) were low-efficiency units that were manufactured by multinational companies, classifying them as environmental dumping. These units were manufactured locally in Argentina or Brazil by multinational companies working through local subsidiaries or partnerships.[12] In Brazil, about 28% of units manufactured in this way were low efficiency, while in Argentina, about 72% of such units were low efficiency.

1.2 Low-efficiency room air conditioners with obsolete refrigerants are widespread in the region

In Latin America and the Caribbean, many new room ACs available for purchase are low efficiency and contain obsolete refrigerants.

Low efficiency

In 2023, nearly 4.3 million low-efficiency new room AC units were sold across nine of the 11 countries examined for this report, representing 52% of total sales.

This analysis found that low-efficiency room AC units accounted for more than 70% of all sales in Mexico, Panama, and the Dominican Republic in 2023. A similar percentage of sales in Chile, Jamaica, and Barbados was likely to comprise low-efficiency units, based on the available data; however, it was not possible to confirm this due to the limited sample size of in-country sales for which data were available.

The study found that Brazil had the lowest percentage

10 Two of the 11 focus countries for this research, Colombia and Uruguay, were not included in the low efficiency and environmental dumping analysis. Colombia was omitted because it uses the energy efficiency ratio (EER) metric to measure room AC performance, and EER cannot be compared nor converted to the seasonal performance metric the authors used in the broader analysis, cooling seasonal performance factor (CSPF). Uruguay was omitted because the efficiency level required for analysis is not displayed at the point of sale in the country.

11 For the purposes of this study, the term *manufacturing* refers to both manufacture and assembly of room ACs.

12 These include joint ventures between two multinational companies, joint ventures between a multinational and locally owned company, or agreements by which a local company manufactures multinational-brand room ACs for the local market.

of sales of low-efficiency units (34% of all sales in 2023) in the LAC region. This is the result of new room AC policies enacted in 2020, combined with rapid industry action to comply with the new standards—providing an example for the rest of the region to follow.

Climate-harming refrigerants

Obsolete refrigerants dominate markets throughout Latin America and the Caribbean.

Both R-410A, which is a high-global-warming-potential (GWP) refrigerant, and R-32, a low-GWP refrigerant, are common in room ACs in the region. R-290, an ultralow-GWP refrigerant, is only beginning to appear in room ACs there (Table 1).

R-410A dominates room AC markets in 10 of the 11 focus countries. However, across all 11 markets studied, 62% of 2023 room AC sales for which refrigerant information was available contained R-32. This is due to R-32's dominance in Brazil, which is the region's largest market.

Grenada is the only focus country to successfully introduce R-290 room ACs, which are expected to reach a 65% share of that country's market by 2028.

Box 1: Defining low-efficiency room air conditioners and climate-harming refrigerants

How does this report define low-efficiency room ACs?

In this study, the authors used the **global benchmark level**, a term they introduced for the minimum energy performance standard (MEPS) levels found in best practice recommendations by United for Efficiency (U4E) in its model regulations for room air conditioners, as well as in China's room air conditioner MEPS, which are currently among the highest in the world.

The global benchmark level serves as a MEPS threshold to define low-efficiency units. It is used in this report because the vast majority of room ACs imported into nine of the 11 focus countries analyzed were manufactured in China.

A metric used for the analysis is cooling seasonal performance factor (CSPF). The global benchmark level is equivalent to: CSPF 6.1 Wh/Wh for cooling capacity (CC) ≤ 4.5 kW, CSPF 5.1 Wh/Wh for 4.5 kW < CC ≤ 7.1 kW, and CSPF 4.5 Wh/Wh for 7.1 kW < CC ≤ 14.0 kW.

Throughout this report, units with efficiencies below this threshold are considered low efficiency. Policies that align with or exceed this level are considered ambitious.

How does this report define climate-harming refrigerants?

In this study, refrigerants with high GWP are defined as climate-harming. GWP is a widely used framework for measuring the relative global warming effects of different gases, including refrigerants. The higher a gas's GWP value, the more it contributes to global warming compared to carbon dioxide (CO_2).[v]

In this analysis, the threshold for climate-harming or high-GWP refrigerants is set at GWP 750[13], per U4E model regulation guidance. This threshold serves as the basis for regulatory bans in several countries, including Singapore and Grenada (upcoming).

Three main refrigerants are used in room ACs: R-410A (high GWP), R-32 (low GWP), and R-290 (ultralow GWP) (Table 1). R-32 is considered a transitional refrigerant, serving as a lower-GWP alternative for countries aiming to reduce climate impact while gradually preparing for the shift to ultralow-GWP options like R-290. Both R-410A and R-32 are hydrofluorocarbons (HFCs) subject for phasedown under the Kigali Amendment of the Montreal Protocol.

13 In this report, refrigerants with a GWP under 750 are classified as having a low GWP.

Table 1: Refrigerants and their properties

Refrigerant	R-410A	R-32	R-290
Ozone depleting potential	No	No	No
Refrigerant type	HFC (blend)	HFC	HC
Scheduled for phasedown	Yes	Transitional[14]	No

(Sources: ASHRAE and UNEP, "Update on New Refrigerants Designations and Safety Classification;" [vi] US EPA, "IPCC AR4, AR5, and AR6 20-, 100-, and 500-Year GWPs;" California Air Resources Board, "High-GWP Refrigerants.") [vii]

1.3 Cooling access remains a challenge

Cooling access remains a challenge in Latin America and the Caribbean. Only 15% of households in the region own air conditioners, and approximately 67.8 million people in the region, or 10% of the total population, are at high risk of a lack of access to cooling. The cooling access gap in focus countries is upwards of 50%, which increases the risk of heat-related illnesses and low productivity, particularly for vulnerable groups such as low-income households and women.

High purchase and operating costs

Low-efficiency room ACs raise consumer costs, undermining the affordability of these critical appliances. A low-efficiency room AC may have a lower upfront cost, but over its lifetime, it can cost consumers more to operate.

High purchase and operating costs, observed in all 11 focus countries, are key barriers to room AC access for low-income households. In Argentina, Brazil, Colombia, Grenada, and Jamaica, the average room AC unit purchase cost is the same as or higher than the median monthly income, which may make these appliances unaffordable for many households. In other countries, the purchase price is below the median monthly income, but the operating cost of running an AC may be unaffordable for households. The electricity cost of operating a room AC can account for 5% or more of median monthly household income in Brazil (5%), Colombia (6%), Grenada (11%), and Jamaica (6%). This can place a significant strain on budgets, particularly for low-to-moderate income households, and may compel families to limit room AC use to only the most essential times.

Access gaps for room AC vary widely across the LAC region (Figure 2). Of the 11 countries studied, six have large access gaps (i.e., greater than 50%), two have medium access gaps (between 35% and 45%), and three have relatively small gaps (less than 20%). Unaffordability is a key barrier to high levels of access, and inefficient room ACs compound this challenge.

Caption: Refrigerant canisters, needed for cooling devices such as ACs. Some refrigerant types have high global warming potential, while newer alternatives are much more climate-friendly. Photo: Ministry of Climate Resilience, The Environment & Renewable Energy of Grenada

14 In this report, GWP R-32 is considered a transitional refrigerant, serving as a low-GWP alternative for countries aiming to reduce climate impact while gradually preparing for the shift to ultralow-GWP options like R-290.

Figure 2: Air conditioning access gaps in Latin America and the Caribbean

Gender disparity in room AC access

In the LAC region, women are more likely to lack access to air conditioning than men. This is largely because they spend more time in homes and informal workplaces, which often lack cooling.[viii] Women in the region bear a disproportionate share of household labor, spending up to three times as many hours a week as men on household chores.[ix] They are also more likely to work in the informal sector: Approximately 48% of women are employed informally, compared to 26% of men.[x]

In addition, women are the sole or primary breadwinners for many households in the region.[15] They also earn 20% less than men, on average.[xi]

Both of these factors exacerbate the unaffordability of room ACs (including the lifetime operating cost of running these appliances) for this group.

1.4 Ambitious appliance efficiency policy is a powerful solution

Appliance efficiency policies are an important solution to environmental dumping, but their use varies widely among the focus countries. Some countries, such as Brazil, maintain mandatory MEPS in combination with labeling schemes and revise them regularly, driving market transformation toward higher energy efficiency. Others maintain only partial room AC regulatory frameworks, such as labeling schemes that may be mandatory (as in Uruguay) or voluntary (as in Barbados).

15 The share of female-headed households in the LAC region ranges between 29% and 50% depending on the country, according to national household surveys and the UN. This number is increasing in most countries in the region.

Caption: Female vendors working outside in the heat with limited cooling options
Photo: Furaichiki/Shutterstock

In some countries, room AC regulatory measures have not been updated in over a decade. Even in those with newer regulations, efficiency requirements are set lower than global benchmark levels, allowing low-efficiency units to enter their markets.

The lack of ambitious room AC policies across the LAC region has significant implications for climate change. In a business-as-usual (BAU) scenario in which no new ambitious efficiency and refrigerant policies are implemented, the widespread use of low-efficiency, high-GWP room ACs across the region could result in cumulative emissions of over **1,350 $MtCO_2e$ by 2050**: the equivalent of emissions from nearly 30 coal-fired power plants operated for more than 20 years.

To reduce emissions from room AC use and achieve long-term consumer energy and cost savings, governments can implement ambitious efficiency and refrigerant policies.

For this report, the authors developed three policy scenarios and analyzed the potential impacts of fully implementing each policy improvement in the 11 focus countries. The findings are summarized below.

Policy scenario 1

Target:

- Achieve global benchmark MEPS[16] in 2027

Projected outcomes:

- A **cumulative reduction of 43 $MtCO_2e$**, equivalent to the emissions of one coal-fired power plant operated for more than 20 years.
- Over **$20 million USD in consumer savings** through 2050.
- Lifecycle cost (LCC) savings equal to an average of $100 USD per consumer.

Policy scenario 2

Target:

- Achieve global benchmark MEPS in 2027 and accelerate the transition to R-290 refrigerant in 2029.

Projected outcomes:

- Emissions reductions of **63 $MtCO_2e$**, equivalent to the emissions of nearly two coal-fired power plants operated for more than 20 years.
- Over $20 million USD in consumer savings through 2050.
- Lifecycle cost (LCC) savings equal to an average of $100 USD per consumer.

Policy scenario 3

Target:

- Achieve global benchmark MEPS in 2027 and more stringent next-generation MEPS[17] in 2029.

Projected outcomes:

- **173 $MtCO_2e$ in avoided emissions**, equivalent to the emissions of more than three coal-fired power plants operated for more than 20 years, equaling more than **13% of projected BAU emissions.**
- Over **$105 million USD in consumer savings** through 2050.
- LCC savings equal to an average of $500 USD per consumer.

1.5 Regional leaders showcase pathways to prevent environmental dumping, demonstrating the benefits of ambitious room air conditioner efficiency and refrigerant policies

Brazil and Grenada offer proof that ambitious efficiency and refrigerant policies can transform the market toward higher-efficiency, lower-GWP units.

Efficiency

After Brazil implemented more stringent labeling and MEPS thresholds, the market share of inverter units, which are more efficient, more than doubled.

In 2020, Brazil raised its labeling thresholds; two years later, it implemented higher MEPS levels (using a seasonal performance metric abbreviated as IDRS for its acronym in Portuguese[18]). Since then, the country's room AC market efficiency has improved significantly, with in-country manufacturers producing more efficient products to comply with the new policies. Inverter units, which are more efficient than non-inverter units, constituted only 30% of the market in 2019. By 2023, inverter market share increased to 65%; in

16 Equivalent to International Organization for Standardization (ISO) CSPF 6.1 Wh/Wh.

17 Equivalent to ISO CSPF 7.59 Wh/Wh.

18 The full name for IDRS is indice de desempenho de resfriamento sazonal, or cooling seasonal performance index.

2026, it is projected to increase to 100% following the introduction of higher MEPS levels.

Today, Brazil leads the LAC region in room AC efficiency, with more than 62% of units with known efficiencies registering at or above the global benchmark level. As of 2023, the median efficiency for the Brazil room AC market was International Organization for Standardization (ISO) CSPF 6.0 Wh/Wh, just below the global benchmark level.

Future room AC efficiency policy changes are projected to create further efficiency improvements. MEPS changes scheduled to be implemented in 2026 are expected to phase out most non-inverter models within the same year.

Manufacturers are actively aligning with Brazil's updated efficiency policy requirements and are also seeking to further improve the efficiency of room AC units manufactured in the country. However, challenges and delays persist, largely due to the nation's local content requirements and challenges with local component suppliers, which affect supply chains for room AC production.

Caption: Efficiency label at an appliance store in Brazil, where the market share of efficient ACs has increased drastically since the country adopted more stringent labeling and efficiency policies Photo: Fernando Luiz Costa de Souza/CLASP

Refrigerants

Grenada is a regional leader in climate-friendly R-290 room ACs, which are projected to make up 65% of the domestic market by 2028.

Caption: Technicians in Grenada are regularly trained on best practices in servicing cooling appliances, including safety requirements when handling flammable refrigerants as part of the country's efforts to transition to the ultralow-GWP refrigerant R-290. Photo: Ministry of Climate Resilience, The Environment & Renewable Energy of Grenada

Since 2005, Grenada has been proactively preparing its domestic market for the adoption of climate-friendly room ACs with R-290, an ultralow-GWP refrigerant, aiming to phase out obsolete refrigerants and promote more sustainable cooling technologies. These efforts have included capacity-building and training initiatives to educate installers on the safe and proper handling of flammable refrigerants; the development of a national code of practice outlining strict safety requirements and institutional procedures for the installation and maintenance of room ACs using flammable refrigerants; stakeholder engagement and awareness campaigns to educate stakeholders about the benefits of room ACs that use R-290; and the elimination of import duties on R-290 units to make them cost-competitive with room ACs using higher-GWP alternatives.

These efforts are bearing fruit. As of 2023, the market share of R-290 room ACs in Grenada reached 10%; it is expected to grow to upwards of 65% in 2028. Grenada has the highest current and predicted share of R-290 room ACs in the region. Furthermore, not only is Grenada a regional leader, but it is also one of the global frontrunners in transitioning to climate-friendly room AC technologies.

1.6 Addressing environmental dumping and obsolete refrigerants is a shared responsibility

Environmental dumping of low-efficiency room ACs and those containing obsolete refrigerants is a global challenge. Solving it is a shared responsibility requiring coordinated action by importing and exporting countries as well as by the private sector, civil society, and international partners. To achieve this, all parties must work together to develop comprehensive, effective solutions for improving access to efficient, climate-friendly room ACs. Collaborations like this are instrumental in tackling these global challenges given the resource constraints facing many low- and middle-income countries that import these technologies.

Coordinated efforts by importing countries in Latin America and the main room AC exporting countries to the region, including China and the Republic of Korea, present an opportunity to identify potential actions to address environmental dumping of room ACs globally. These actions are also expected to cultivate strong drivers for green development of the global room AC industry.

Photo: Fernando Luiz Costa de Souza/CLASP

02 Research context and scope

2.1 Project background

With global temperatures rising, cooling has become increasingly crucial for human well-being. In 2024, the United Nations Secretary-General called on economies to take urgent action to prevent and reduce extreme heat and its impacts.[xii]

In the LAC region, the International Energy Agency (IEA) projects that the annual number of cooling degree days[19] between 2041 and 2060 will increase by 29%–43% relative to 1990–2000.[xiii] This translates into an increasing need for room ACs and longer AC operating periods.

Despite this growing need for room ACs, access to these appliances remains a challenge in the LAC region. The lack of access also presents an opportunity to ensure climate-friendly solutions are employed from the outset. The principal cooling-access barriers include the purchase cost of the appliance, ongoing operating and maintenance costs, and the relative lack of consumer financing tools available.

Strategies including passive cooling[20] and district cooling[21] also play a key role in increasing access to cooling; however, these are outside the scope of this report.

A need for efficiency to combat extreme heat

In the last decade, the LAC region has seen a 20% increase in the ownership of household appliances, including room ACs.[xiv] In the coming years, growth in the room AC market is expected to remain strong (at an estimated 2%–7%) throughout the region, driven by factors including increasing temperatures, economic growth, and financial incentives.

Growth in room AC adoption may significantly increase electricity demand, including demand from fossil-fuel power plants which release climate and air pollutants, especially in the summer, when demand can rise by up to 50% in countries with warmer climates, straining electricity grids.[xv] Efficient cooling technologies are a vital solution, reducing strain on the power grid while helping more people access appliances by lowering the cost of energy needed to operate them.

Technological innovations have enabled the introduction of highly efficient room ACs in markets around the world, including the LAC region. Despite this, many markets in the region are dominated by inefficient units, which make up over half of total sales in the countries studied.[22]

Moreover, many room ACs in the region use high-GWP refrigerants that, by definition, exacerbate climate change, leading to increased need for air conditioning.

As explained in Section 4.2, energy efficiency and refrigerant policies in the LAC region lag behind innovations in room AC technology.

Environmental dumping

LAC countries face environmental dumping of new inefficient room ACs that often contain climate-harming refrigerants.

19 Cooling degree days (CDDs) are calculated by determining the difference between the daily average temperature and 65 °F or 18 °C. They assume that when the outside temperature is 65 °F or 18 °C or lower, cooling is not needed to be comfortable. Therefore, CDDs are a measure of how much and for how long cooling is needed over a given period.

20 Passive cooling refers to non-mechanical methods of reducing indoor temperatures using architectural design, natural ventilation, shading, and thermal properties of materials.

21 District cooling is a centralized system that produces chilled water at a plant and distributes it via insulated underground pipes to multiple buildings for air conditioning.

22 Refer to Section 4.1 for detailed analysis.

Environmental dumping is a longstanding concern among affected Global South governments and environmental advocates. In 1993, delegates representing low- and middle-income countries at the Montreal Protocol used the term to describe shipments of inefficient cooling equipment with obsolete, ozone-depleting, and climate-harming refrigerants that were received in their markets.[xvi]

In 2018, environmental dumping was defined in a legal framework elaborated in a Duke University Environmental Law & Policy Forum paper.[xvii] While the broad definition applied to various environmentally harmful products, the paper also provided a definition specific to refrigeration and cooling equipment. It described environmental dumping of such equipment as encompassing exports of technology that:

1. cannot be sold legally in the exporting country because of the enforcement of minimum standards for safety, energy efficiency, environmental performance, or others; or
2. cannot be used in the exporting country because the refrigerant is no longer available as a result of existing controls under the Montreal Protocol.[xviii]

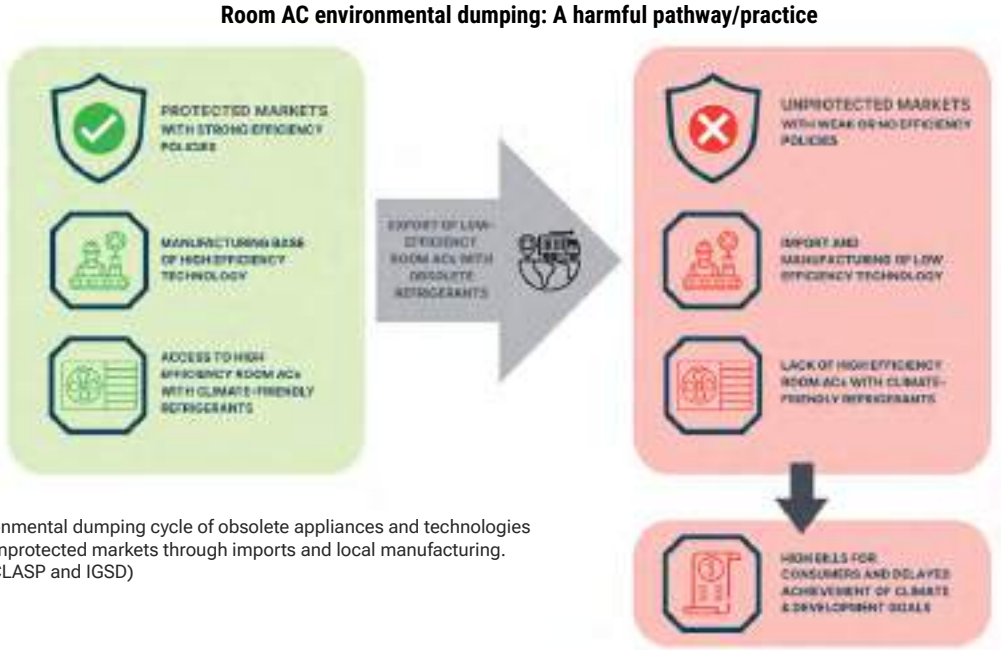
The authors have used this framework to assess environmental dumping of room ACs for this and previous research on this topic. They categorized equipment origins and trade flows based on this definition to determine whether particular room AC units meet the definition criteria for environmental dumping.

In this framework, environmental dumping includes:

1. the importation of new low-efficiency room AC units, or of components used to manufacture such units, from countries where these units cannot be sold, either by multinational companies or by companies headquartered in the importing country, or
2. the local manufacturing of new low-efficiency units by multinational companies that have the knowledge and experience needed to manufacture higher-efficiency units.[23]

Recent studies conducted by CLASP and IGSD in Southeast Asia[xix] and Africa[xx] provided evidence of environmental dumping of room ACs in both regions. In Southeast Asia, 6.2 million low-efficiency room ACs were sold in 2021, representing 74% of total sales in six countries, of which 59% were classified as environmental dumping. In Africa, 650,000 low-efficiency room ACs were sold in 2018, of which 26% were imported from outside the continent.

Figure 3: The practice of appliance dumping



The environmental dumping cycle of obsolete appliances and technologies flooding unprotected markets through imports and local manufacturing. (Source: CLASP and IGSD)

23 In some countries, multinational brand room ACs are assembled locally by local companies through partnership agreements that can include manufacturing of certain product lines, distribution of multinational brand products, and other conditions. Such practices are considered dumping, as the multinational companies involved in these partnership agreements have the knowledge and experience to manufacture more efficient technologies.

Caption: While temperatures in Latin America & the Caribbean are rising and the cooling market keeps growing, many remain without access to cooling
Photo: R.M. Nunes/Shutterstock

These results show that developing regions face environmental dumping of low-efficiency room ACs.

The increasing need for space cooling, alongside the risk of environmental dumping of low-efficiency room ACs, may exacerbate existing challenges in making sustainable cooling services accessible in developing countries. According to SEforALL's 2023 Chilling Prospects report, people's lives and livelihoods in Southeast Asia, Africa, and the LAC region are at medium to high risk due to the lack of access to cooling. In the LAC region alone, 67.8 million people are at high risk due to the lack of access to cooling.[xxi]

2.2 Research questions and objectives

This research sought to assess the extent of environmental dumping of room ACs in the LAC region and examine linkages to cooling access and affordability. Its objectives included:

- Conduct a region-wide room AC market study and a review of trade practices, policy landscapes, and other factors, gathering detailed evidence on the extent of environmental dumping and the underlying factors that enable it in the LAC region.
- Understand how environmental dumping may contribute to the lack of access to cooling in the LAC region, especially for women and low-income households, and highlight the opportunities to improve access to efficient and affordable cooling appliances.
- Spur action on the national level across the LAC region, as well as regionally and globally, to increase the availability of high-efficiency room AC technologies for consumers and stop the dumping of low-efficiency and high-GWP cooling appliances.

Data sources

To develop a holistic understanding of the room AC market (for new units only) in the LAC region, the authors analyzed trade flows, as well as market and product-level data. Market and brand share data from 2023 provided by the market research firm BSRIA were used to approximate total product sales per brand in each country. These figures were combined with data gathered by local partners on popular room AC models available in stores and online in 2025. UN Comtrade data for 2023 was used to assess trade flows. In addition, policymakers, government agencies' resources across 11 countries, and various reports and databases (e.g., from the World Bank) were consulted to obtain information on policies covering efficiency, refrigerants, and trade, as well as access to and affordability of room ACs in 2023.

See Annex 1 for detailed information and methodology.

Geographical scope

This study covered 11 Latin American and Caribbean countries: Argentina, Barbados, Brazil, Chile, Colombia, the Dominican Republic, Grenada, Jamaica, Mexico, Panama, and Uruguay (Figure 4).[24] The geographical scope was limited to 11 countries for this project because of resource and time constraints.

Ensuring equitable representation of different country types was a priority in selecting the focus countries. A mix of manufacturing and importing countries was chosen. The selection also considered countries' existing efficiency policies and socioeconomic factors such as population size and income level.

Altogether, the 11 countries included in this analysis were chosen to form a representative sample that reflects the region's diverse trade flows, demographic profiles, economic conditions, and policy and social contexts.

24 While the report doesn't cover all 33 countries in the region, the findings may be indicative of general trends in Latin America and the Caribbean.

Figure 4: Focus countries

Appliances included in the research scope

The study assessed room ACs, which, for the purposes of this study, are defined as single split room air conditioning systems with inverter or non-inverter compressor technologies. Room AC units with capacities up to 10.5 kW were included in this study, with the vast majority of all units (94%) having a capacity of less than 5.86 kW.[25]

These systems were selected because small-capacity split room ACs are the most popular AC systems used in the residential and commercial sectors in the focus countries. Other types of room ACs, such as window and portable, are also available, but they constitute comparably small market shares and/or are being replaced by split systems.

Defining low efficiency

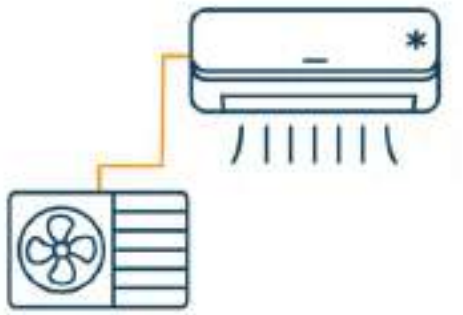
Broadly speaking, two methods are used to assess the efficiency of room ACs: seasonal and non-seasonal performance metrics. Seasonal metrics such as seasonal energy efficiency ratio (SEER) and cooling seasonal performance factor (CSPF) measure performance across a range of temperatures and load conditions. Non-seasonal metrics like energy efficiency ratio (EER) assess efficiency at a single full-load condition and do not account for partial-load performance or seasonal variation. Seasonal metrics provide a more accurate reflection of real-world usage than non-seasonal alternatives.

25 In countries where efficiency data were scarce, units with capacities above 5.86 kW were included in this research. While these may not fully reflect the domestic room AC market, their inclusion represents the most feasible approach given information constraints in the local markets.

Box 2: Room air conditioning technologies covered in this research

Single split room AC

A type of air conditioner system consisting of one indoor and one outdoor unit, intended to cool a single room or zone.



Inverter

A technology that allows the room AC compressor to operate at variable speeds depending on the cooling demand, adjusting cooling output based on need. It is typically more energy efficient than non-inverter technology.

Non-inverter

A compressor technology that operates at fixed speeds, turning on at full power when cooling is needed and off when it is not.

For this analysis, the authors selected the International Organization for Standardization (ISO) CSPF metric due to its superior accuracy in capturing efficiency across seasonal variations and partial load conditions. The United for Efficiency (U4E) model regulation also recommends this metric for room ACs.

Efficiency data in SEER was converted to align with ISO CSPF standards. The authors excluded data in EER metric from the low-efficiency analysis, as no reliable conversion to CSPF is currently possible.

For the purposes of this study, low-efficiency room AC units are defined as room AC units that do not meet global benchmark efficiency levels, as defined in Table 2.

Table 2: Global benchmark efficiency levels for different room AC cooling capacities

Cooling capacity (CC)	CSPF[26]
CC ≤ 4.5 kW	≥ 6.1 Wh/Wh
4.5 kW < CC ≤ 7.1 kW	≥ 5.1 Wh/Wh
7.1 kW < CC ≤ 14.0 kW	≥ 4.5 Wh/Wh

(Source: CLASP analysis)

The authors selected the global benchmark threshold for two reasons:

- China is the major supplier of room ACs to importing countries in the region, and the global benchmark aligns with China's MEPS. China has demonstrated success in implementing this MEPS level, rendering these "model" efficiencies technologically achievable for the LAC region and other markets. Thus, this threshold serves as a benchmark for identifying dumping, which is defined as the export of products that fail to meet the efficiency standards of the exporting country.
- These MEPS levels are listed in the U4E model regulations,[27] serving as a recommended benchmark with which countries can harmonize their standards.

Differences in test methods may result in different levels of reported efficiency, even when using similar efficiency metrics. For this reason, this study uses a

26 Converted from China SEER in GB 21455—2019 to ISO CSPF using "Lost in translation" (2020) by Park *et al.* https://doi.org/10.1016/j.esd.2020.01.003.
27 In September 2019, United for Efficiency (U4E) published model energy performance standards and labeling guidance to assist governments in developing and emerging economies in establishing or strengthening their regulations. https://united4efficiency.org/resources/model-regulation-guidelines-for-energy-efficient-and-climate-friendly-air-conditioners/.

"marginal efficiency" categorization to identify units that are expected to meet the global benchmark level but may have lower declared efficiencies due to differences in test methods.

The marginal efficiency categorization refers to units that have reported efficiencies within 5% of the global benchmark level. It was used only for Brazil, which uses a version of the international test standard[28] that has been customized to reflect regional temperature conditions. Since other focus countries use standardized test methods for CSPF or SEER for which conversion to CSPF is available, marginal efficiency categorizations were not calculated for these countries.

Country representation in analysis and modeling

Findings during the research phase led to two countries, Colombia and Uruguay, being omitted from the low-efficiency analysis (Table 3). In Colombia, the efficiency metric used, EER, is incompatible with the one used for the analysis, CSPF. Uruguay, which also uses the EER metric, had no efficiency data present at the point of sale.

These countries were included in all other analyses conducted for this study.

Table 3: Focus countries included in low-efficiency analysis

Focus country	Included in low-efficiency analysis
Argentina	Yes
Barbados	Yes
Brazil	Yes
Chile	Yes
Colombia	No
Dominican Republic	Yes
Grenada	Yes
Jamaica	Yes
Mexico	Yes
Panama	Yes
Uruguay	No

(Source: CLASP analysis)

28 The Brazilian seasonal efficiency metric, IDRS, employs partial load conditions and temperature bin methodologies like those used in ISO CSPF to quantify a room AC unit's efficiency. The efficiency level difference between traditional ISO 16358:2013 testing and Brazil's test method, which was modified by introducing criteria in Ordinance No. 179 for using 29°C test point at partial load conditions, is estimated to be within 5%.

Photo: Fernando Luiz Costa de Souza/CLASP

03 Room air conditioner market and trade

3.1 Overview of the room air conditioner market in Latin America and the Caribbean

Market growth

In 2024, the global room AC market reached 140 million units, growing by 4% compared to the previous year.[xxii] The highest growth rates were in the Middle East, South Asia, and Southeast Asia,[xxiii] primarily due to increasing temperatures, improving economic conditions, and urbanization.

In China, the world's largest room AC manufacturer and exporter, room AC exports grew by nearly 30% from 2023 to 2024.[xxiv] At the same time, domestic demand declined, causing overcapacity in room AC production that was partially mitigated by export growth.[xxv] In 2024–2025, China's trade-in and equipment renewal program, which features subsidies of up to 20% of the product price (capped at about $300 USD), has significantly increased purchase of efficient appliances.[xxvi]

Meanwhile, Southeast Asia has been transitioning into a hub for room AC manufacturing and exports, becoming the second-largest room AC global production base.[xxvii]

In Latin America and the Caribbean, room AC market growth in 2024 (estimated at 2.1%) was slower than the global average due to economic and political uncertainties in some markets.[xxviii] The majority of room AC units sold in the region (94%) in 2023 were single split systems, with window and portable room ACs accounting for the remainder of the sales.[29,xxix] Brazil, Mexico, and Argentina have the largest room AC markets among the focus countries (Figure 5).

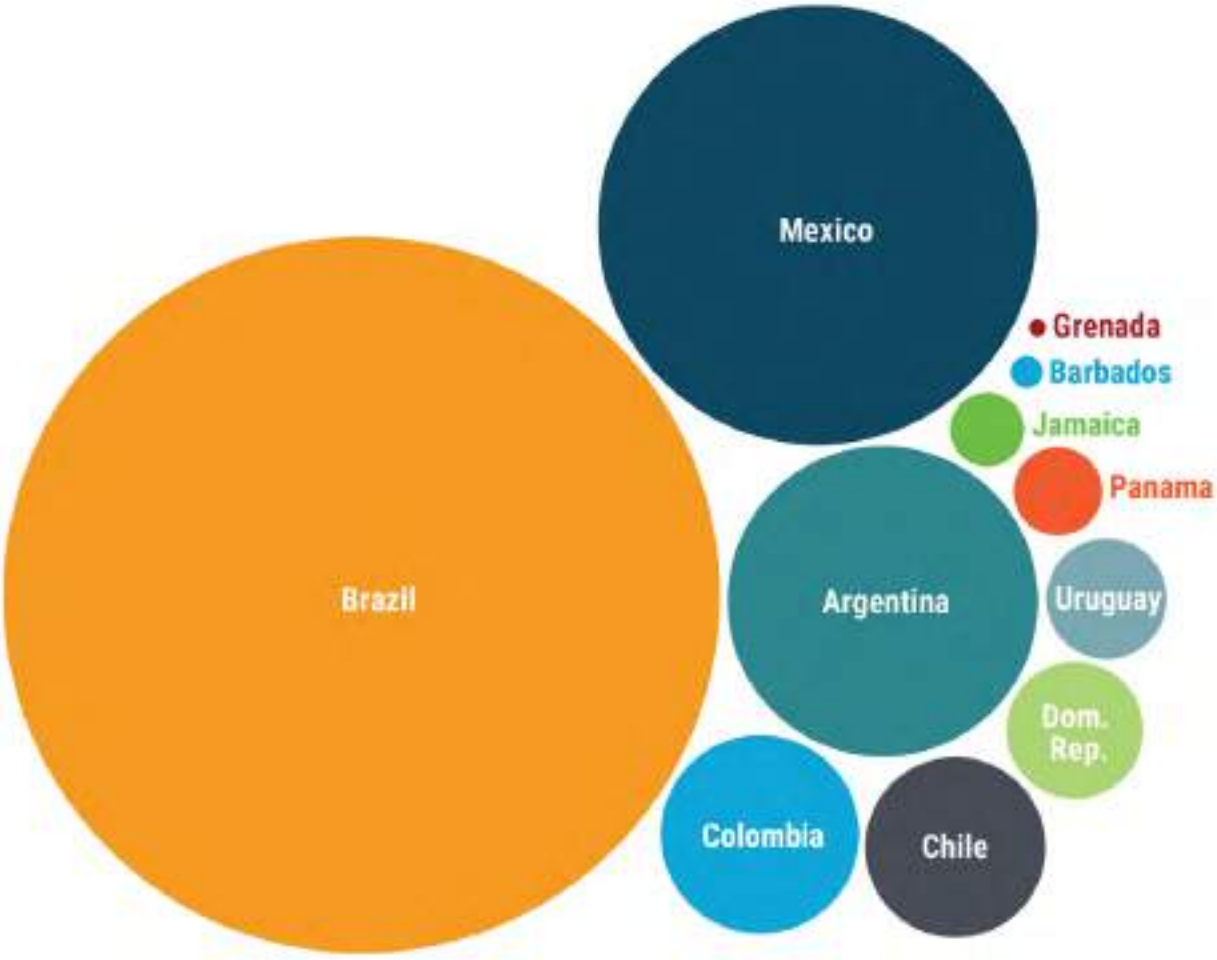
In 2023, the single split room AC market in 11 LAC countries reached 8.6 million units, with Brazil, Mexico, and Argentina accounting for 88% of the total. Sales increased significantly across the region during this year, driven by heat waves and unexpectedly high summer temperatures. Countries such as Grenada, Argentina, Brazil, Jamaica, and Uruguay experienced over 19% growth in room AC sales, with Grenada nearing 70% growth.[xxx] Growth was modest in Chile and Panama; in Colombia, it declined slightly.

Market expansion is expected to continue at a rate of 2%–7% annually, driven by rising temperatures, economic growth, and supportive financial policies.[xxxi]

Photo: Fernando Luiz Costa de Souza/CLASP

29 In Brazil, window unit sales had been declining until 2024, when they increased significantly to over 1 million units annually. According to local experts, this increase is theorized to have been a response to longer and more frequent heat waves in the country, which has increased demand for cooling beyond what the local market can produce and encouraged the importation and installation of ad-hoc window units. Despite their resurging market share, these units fall outside the scope of this report and are not included in subsequent analysis.

Figure 5: Room air conditioner market sizes in 11 economies in Latin America and the Caribbean, in units sold



The largest room AC markets among the 11 focus countries are in Brazil, Mexico, and Argentina, and the smallest are in the Caribbean countries of Grenada and Barbados. (Source: BSRIA data, 2023)

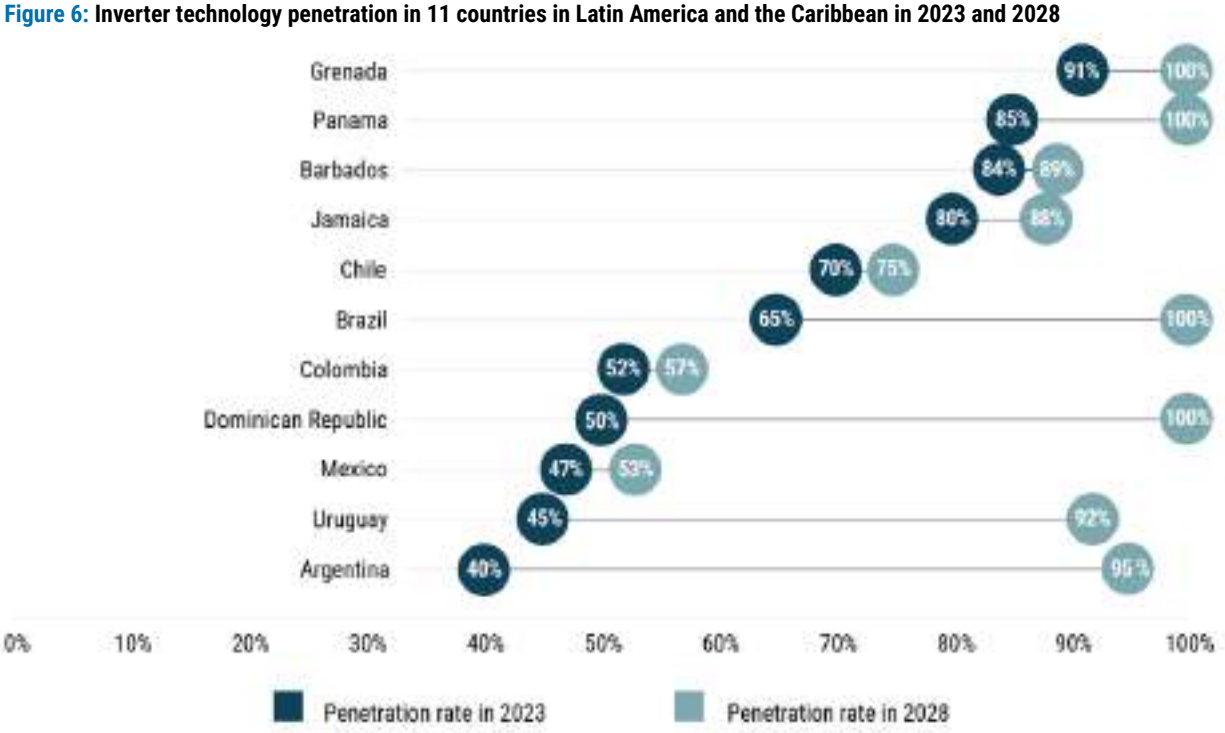
Inverter technology penetration

The region is transitioning to inverter room AC compressor technology, which can be up to 51.7% more efficient than non-inverter compressor technology (Figure 6).[xxxii] In 2023, inverter room AC penetration exceeded 80% in smaller markets like Grenada, Panama, Barbados, and Jamaica,[xxxiii] largely due to high electricity costs and other factors that encourage consumers to purchase more efficient units.

Where strong efficiency policy interventions exist, they have proven effective at accelerating the inverter transition. In Brazil, the introduction of technology-neutral efficiency policy and a seasonal performance metric increased the proportion of inverter units from an estimated 30% market share in 2019 to 65% market share in 2023.[xxxiv] However, in other countries, the transition has not progressed as quickly: in Mexico, for example, low electricity prices and demand for cheaper units have slowed the shift to inverters.

Market dynamics also influence inverter adoption. For example, LG lost market share in Mexico after discontinuing non-inverter models, prompting the company to reintroduce these technologies.[xxxv]

Figure 6: Inverter technology penetration in 11 countries in Latin America and the Caribbean in 2023 and 2028

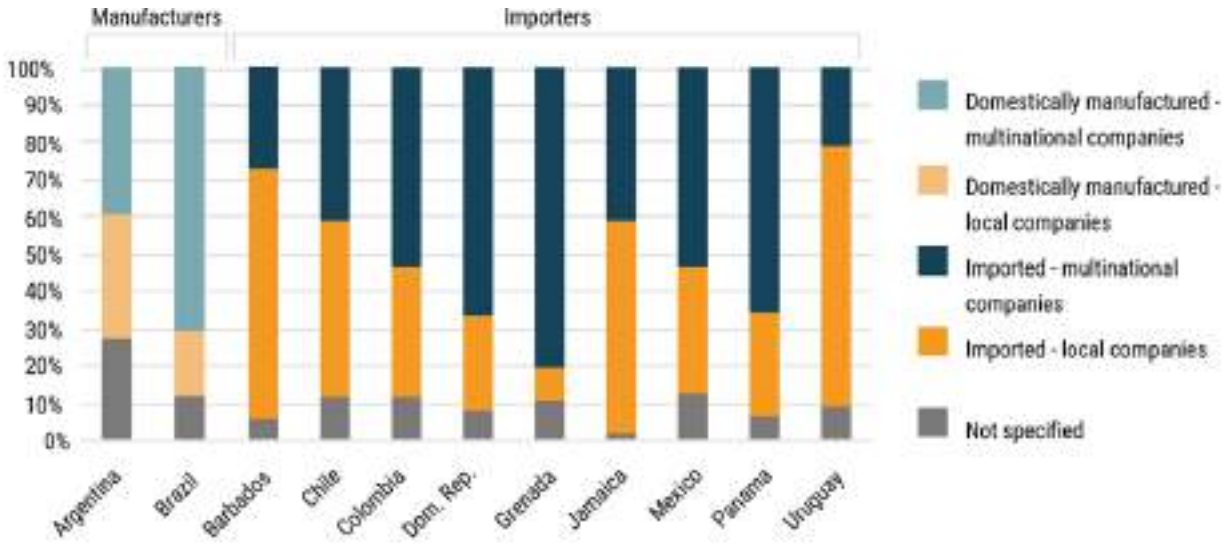


Room AC markets in Brazil, the Dominican Republic, Grenada, and Panama are expected to contain only units with inverter technology by 2028. The transition is slower in other countries. (Source: BSRIA 2023 and 2028)[30]

Multinational and local brands

All 11 markets studied contain a mix of multinational and local brands (Figure 7). Local brands either manufacture room ACs domestically (as is seen in Brazil and Argentina) or import them from Chinese OEMs, including Midea, Gree, Aux, and TCL, then rebrand them.

Figure 7: Types of brands in each market studied



Multinational brands dominate most markets in the LAC region, but local brands are more common in Barbados, Chile, Jamaica, and Uruguay. (Source: BSRIA, 2023)[31]

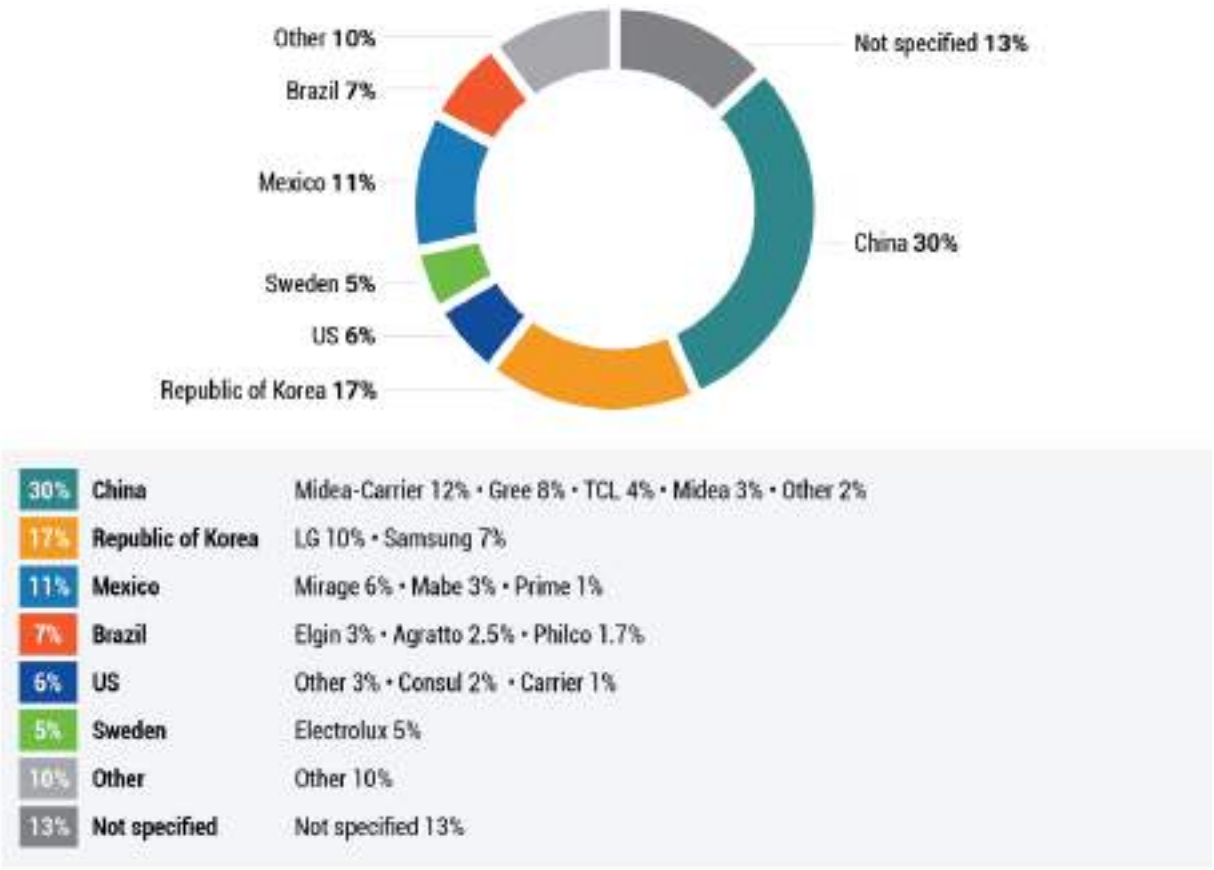
30 Because in-person data collection was not conducted in the Brazilian market, the 2023 inverter penetration rate for Brazil was calculated from online web scraping from the e-commerce site Magazine Luisa. These data have been validated with data from the Brazilian product registry. Brazil also expects to have 100% inverter penetration rate after a policy revision comes into place in 2026. For Grenada (2023), Panama (2023), and Dominican Republic (2028), inverter unit penetration rates were revised to align with in-person sales data as they were perceived to be more accurate.

31 The category "Not specified" represents part of the market that has not been characterized but is represented in the graph to provide a full picture of the market.

Room AC markets in the 11 focus countries are fragmented, with most brands holding smaller shares ranging from 27% to less than 1%. Only in Barbados, Grenada, and Jamaica do single brands dominate (with shares of about 40%).

Different brands have different specialties. Brands headquartered in China tend to offer competitively priced products, which has contributed to their growing market share in recent years; they currently lead regionally, accounting for 30% of the LAC market. Korean brands, which account for 17% of the LAC market, tend to focus on higher-end room ACs (Figure 8).

Figure 8: Brands with market shares and their headquarters

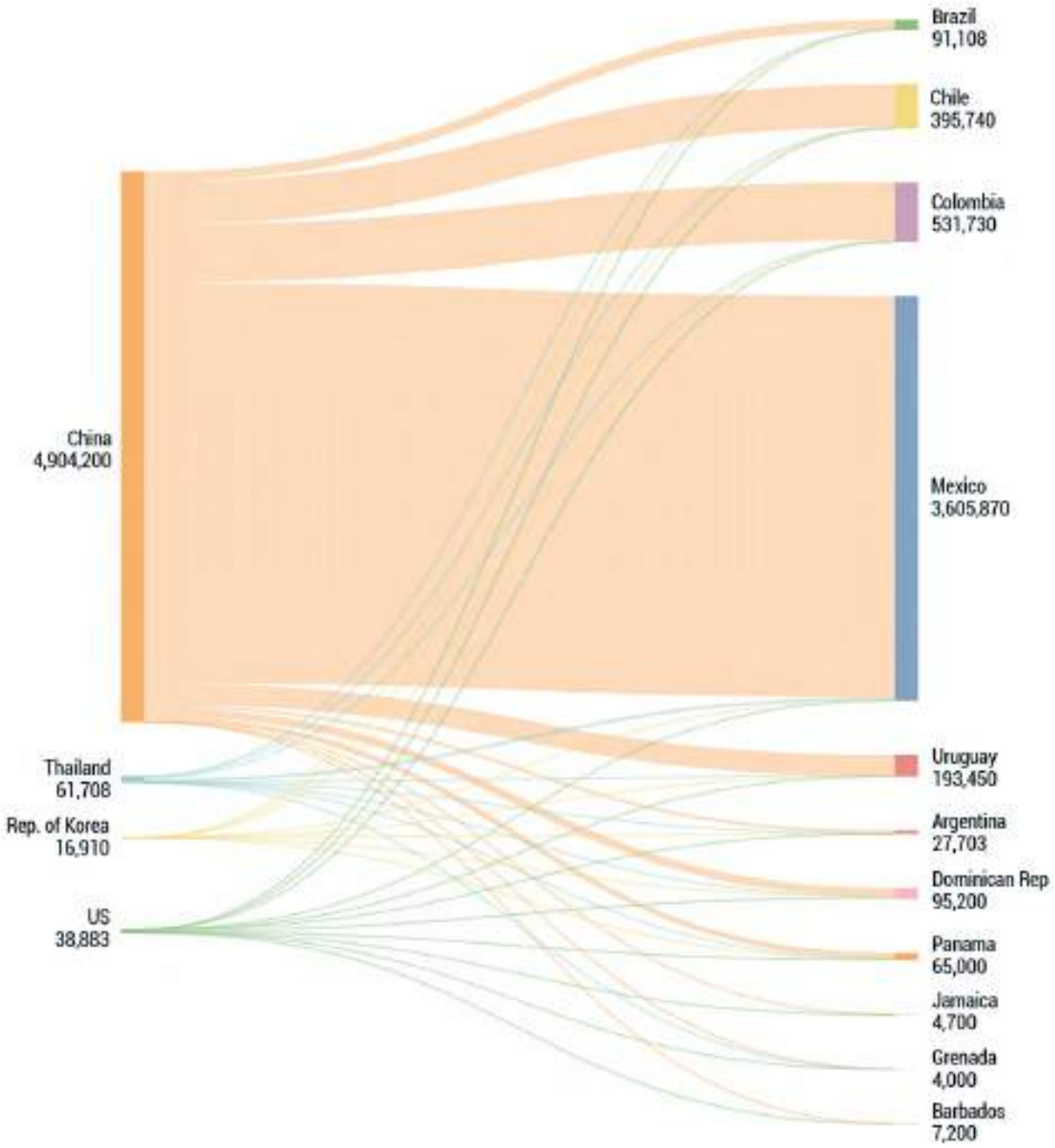


Multinational companies based in China and the Republic of Korea dominate overall sales of room ACs. Brazil, where units are locally manufactured, and Mexico, where they are imported and given local branding, also account for a substantial share of sales. (Source: BSRIA, 2023)

3.2 Trade flows and trade agreements

Split room AC systems sold in the LAC region are imported (primarily from China) as well as locally manufactured (but only in Argentina and Brazil).[32]

Figure 9: Room air conditioner trade flows in Latin America and the Caribbean, in thousands of units



Countries are displayed only if bilateral trade flows meet or exceed 4,000 units. Most room AC imports in the 11 focus countries originate in China. Imports from other countries are minimal, and intra-regional room AC trade is insignificant. (Source: UN Comtrade Data, 2023)

32 Mexico is another manufacturer of ACs in the region, although the country primarily manufactures commercial and industrial units for export. Since the scope of this study includes only single split room ACs, Mexico was not considered a manufacturer for the purpose of this study.

According to UN Comtrade data, China exported over 99%[33] of room AC imports to 11 LAC countries in 2023, totaling an estimated 4.9 million units (Figure 9), with the majority destined for Mexico (75%), Colombia (11%), and Chile (8.2%). Other import sources, such as the United States, Thailand, and the Republic of Korea, contributed much smaller volumes.

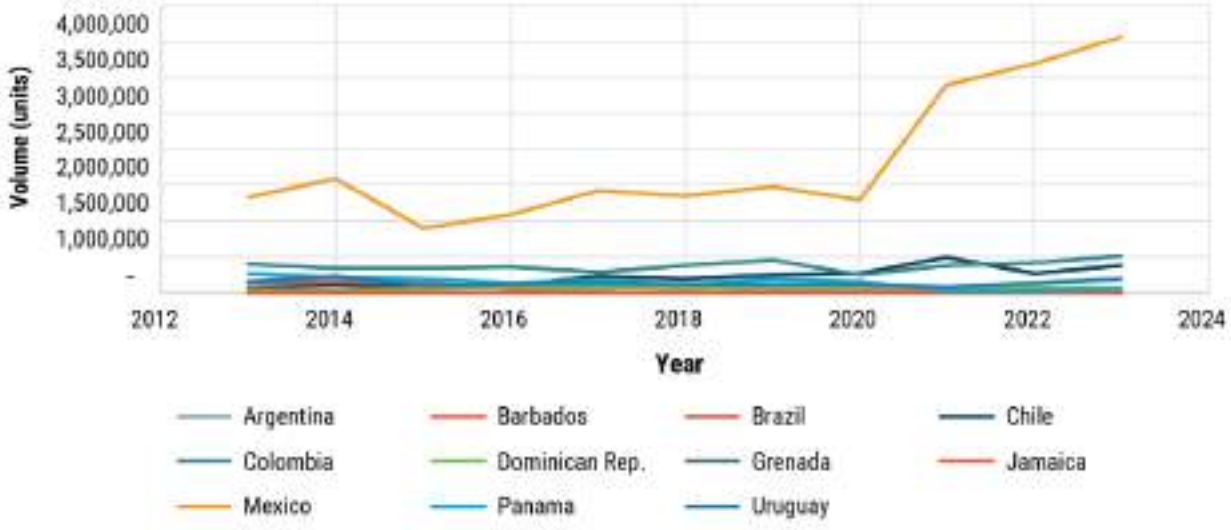
Intraregional trade within the 11 focus countries in the LAC region remains minimal. Excluding Panama, pass-through trade is not happening with any significant trade volume for these countries. In Panama, a high proportion of imported units are re-exported, indicating that the country is a key transit hub that facilitates trade within and outside the LAC region, particularly through its free trade zones (FTZs). Up to 25% of room ACs imported and re-exported to countries in the LAC region go through Panama, primarily through the Colón Free Trade Zone, which is the largest FTZ in Latin America and the second largest worldwide.[xxxvi]

Over the last decade, the volume of room AC imports into the 11 focus countries from China stayed largely the same or saw a slight increase in the focus economies, with the exception of Mexico (Figure 10).

This growth in the room AC market in 2023 likely stems from several factors: extreme weather events and record-high temperatures, strong foreign investment driving economic expansion, a gradual decrease in inflation bolstering consumer confidence and spending, and a robust post-COVID rebound in the construction sector. Also, in 2020, the heating, ventilation, and air conditioning HVAC industry was declared an essential industry for public health due to the COVID-19 pandemic, which may have also contributed to the demand growth.[xxxvii]

Various policies, including import tariffs, energy efficiency standards, free trade agreements, and local content requirement policies, impact markets and trade across the region. This influence takes various forms. High import tariffs can make imported products less competitive (as seen in Argentina), while free trade agreements facilitate trade. Energy efficiency standards can be employed to restrict imports of low-efficiency room ACs. Local content requirement policies can encourage in-country investment and local production over imports (as seen in Brazil).

Figure 10: Volume of room air conditioner trade imports to Latin America and the Caribbean from China



Imports from China remained steady over the past decade, except in Mexico, which has experienced sharp increases in room AC imports since 2020. (Source: UN Comtrade data, 2013–2023)

33 This study used two data sources to estimate the proportion of Chinese imports to the 11 focus countries: in-store data and Comtrade data. Discrepancies in import figures from China between the two sources likely arise from differences in data collection methods—Comtrade data are recorded using HS codes at the point-of-entry to the country, while in-store data reflect the actual room AC units available at the point-of-sale to consumers.

Barriers to intraregional room AC trade

Intraregional trade of room ACs in the LAC region is limited by economic, regulatory, and technical factors.

Room ACs manufactured in Argentina are less cost-competitive than imported units from major room AC producers like China because of transport and labor costs.[xxxviii] Inflation and import tariffs can also contribute to higher prices.

Another barrier to interregional trade is the variation in test standards, policies, and performance metrics found across the region. This creates a burden on manufacturers to comply with different policy frameworks.

Furthermore, differences in voltage[34] and frequency[35] standards across LAC countries create incompatibility and can lead to challenges in efficiency policy harmonization efforts, trade of room ACs, and compliance testing.[xxxix]

Section 4.2 discusses the harmonization of efficiency policies and standards and its benefits.

Trade policy agreements

Agreements impacting trade in the LAC region are detailed below.

Intraregional trade agreements

Within the region, several agreements stand: the Mercosur trade bloc in South America, the Andean Community trade agreement in the Andean region, and the Caribbean Community (CARICOM) in the Caribbean region. There are no tariffs for room ACs traded between members of these individual trade blocs. See Annex 2 for more information.

Trade agreements with China

Chile is the only focus country that has a free trade agreement with China. This agreement, which was signed in 2006 and upgraded in 2017, eliminated or heavily reduced tariffs on room ACs imports from China.

The Belt and Road Initiative (BRI) is China's primary approach to international cooperation and trade.[xl] Over 140 countries have signed cooperation agreements with the BRI, including eight of the focus countries for this report.[36],[xli] While BRI countries are not necessarily involved in trade agreements with China, partner agreements can include trade terms with China. This can create trade hubs, facilitate trade and investment, and even harmonize customs regulations and procedures.[xlii]

Free trade zones

Free trade zones (FTZs) offer incentives for manufacturers, importers, and exporters to operate there.[xliii] In many cases, they allow for deferred tariffs and taxes while goods remain in the zone. FTZs are also often strategically located near ports and airports, lowering transport costs. FTZs that allow local assembly or manufacture of products attract foreign direct investment and create jobs. Re-export may be more advantageous from an FTZ due to strategic location and exemption from domestic tariffs. These FTZs are described in more detail in Annex 2.

3.3 Local room air conditioner production and policies

Argentina and Brazil are the only room AC producers[37] in the region, producing 4 million and 0.9 million split units in 2023, respectively.[xliv] Brazil and Argentina manufacture room ACs primarily for their domestic markets and have limited imports from and exports to other countries.

Both countries have local content requirements (LCRs) policies that require certain percentages of production inputs to be sourced from domestic manufacturers. These policies aim to promote domestic industry and employment and foster economic growth.[xlv]

34 Some LAC countries use 120V systems (e.g., Mexico), while others use 220–240V systems (e.g., Brazil, Argentina, and Chile). Room ACs are designed for a specific voltage input, so using a 220V unit in a 120V country (and vice versa) will not work without a transformer, which is costly and may create safety issues.
35 Motors and compressors in room ACs are tuned to a specific frequency; using a mismatched frequency with a unit negatively impacts performance and lifespan. For example, 60Hz is common in most Latin American countries (e.g., Mexico, Colombia, Brazil) while 50Hz is used in Argentina and some Caribbean countries.

36 Argentina, Barbados, Chile, the Dominican Republic, Grenada, Jamaica, Panama, and Uruguay.
37 In two countries, some manufacturers assemble room AC units, while others perform partial or full manufacturing of components.

Argentina

In Argentina, the dominance of domestic room AC assembly over direct imports is largely due to the country's special industrial promotion regime, which provides significant tax and customs benefits to room AC manufacturers in the Tierra del Fuego[38] FTZ.[xlvi] Argentina has also tightly regulated room AC imports to limit international competition with local production and imposes explicit anti-dumping tariffs and duties on room AC imports from China.[xlvii] Collectively, these policies shield locally produced products from competition with imports.

Argentina enforced LCRs in the 2000s and 2010s, encouraging local assembly of room AC imports.[xlviii] Today, over 95% of room ACs sold in the country are assembled locally. However, with the country's shift toward trade liberalization and deregulation, LCRs are now largely unenforced, likely increasing import competition.

Brazil

In Brazil, 99% of room AC demand is met with locally assembled units whose components are primarily imported from China.[xlix] The country has one local compressor manufacturer, Tecumseh, but it currently supplies less than 20% of the compressor demand for domestic room AC manufacturing.[l] Forthcoming updates to local content requirements, set to go into effect in 2027, will likely require Brazilian room AC manufacturers to use a larger share of locally manufactured compressors. According to interviews with several local manufacturers, many industry players have raised concerns that the quality of locally manufactured compressors may impede room AC manufacturers' ability to meet stringent efficiency levels under Brazil's labeling program.

Brazil previously required 30% local content for inverter compressors (down from 60%), but now uses the Basic Production Process (PPB), a point-based system setting minimum local content based on room AC type.[li] Non-inverter units typically face stricter LCRs than inverter models. Manufacturers often set up factories in the Manaus FTZ, where they benefit from tax and tariff exemptions if PPB rules are followed, despite high tariffs and complex customs procedures.

More details about FTZs can be found in Annex 2.

3.4 Room air conditioner prices

This analysis found significant room AC price variation among the focus countries. In countries with high room AC prices, low- and medium-income households may not be able to purchase these appliances.

The price of room ACs can be impacted by various technical, market, and economic factors. Technical factors include room AC type (e.g., cooling-only vs. cooling-heating, inverter vs. non-inverter), additional functionality and premium features (e.g., WiFi, dehumidification, air purification), cooling capacity, and energy efficiency. Non-performance elements such as brand reputation, seasonal demand, manufacturing location, and material costs may also impact prices. Market factors include competition, seasonal climate patterns (e.g., prices may rise during heat waves), and consumer preferences. Economic factors, including subsidies, import duties, value-added taxes, and policies protecting local manufacturing, can also impact prices.

This study compares room AC prices[39] among the focus countries for both cooling-only and cooling-heating (also known as heat pump) room ACs. Preferences for cooling-only and cooling-heating technologies differ by country. Cooling-only room ACs dominate the market in hot Caribbean countries, but cooling-heating units are prevalent in temperate countries such as Chile, Argentina, and Uruguay.

On average, cooling-heating units are more expensive than cooling-only units, though prices also depend on the factors discussed above.[40] Our research found that average prices for 3.52kW room ACs varied between $342 USD to $728 USD for cooling-only units, and between $504 USD and $1,162 USD for cooling-heating units (Figure 11). On average, the least expensive cooling-only units were found in Panama and the most expensive in Grenada. For cooling-heating room ACs, the least expensive were found in Uruguay, followed by Brazil. The most expensive were found in Grenada and Argentina.

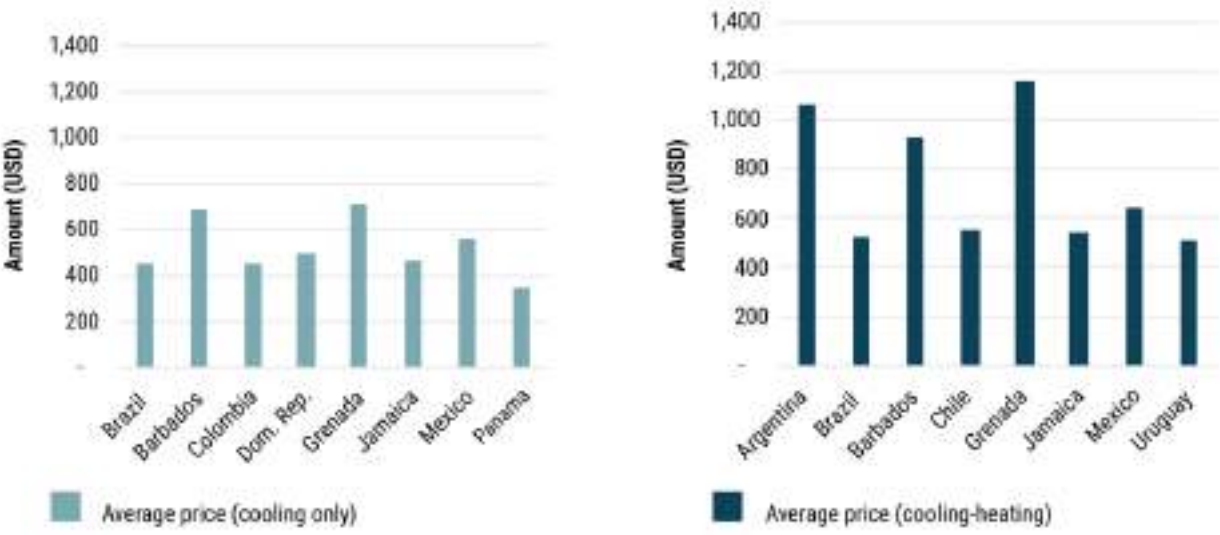
38 More than 95% of room ACs sold in the domestic market are assembled locally in Tierra del Fuego from imported components sourced primarily from China, Thailand, and Malaysia and sold under license from multinational brands (e.g., LG, Samsung) by companies including BHG, Newsan, and Mirgor.

39 These are normalized, or adjusted, prices for a 3.52kW capacity unit for each country based on the data gathered during in-store data collection.

40 Detailed price analysis (e.g., various added taxes and fees) was out of scope for this study.

High purchase costs are also linked to country-level factors. In Argentina, most room ACs are manufactured domestically in Tierra del Fuego and have little to no competition with imports due to protectionist trade policies, which may increase prices.[41] High room AC prices in Grenada, where sales consist primarily of cooling-only units, can be attributed to logistical factors (e.g., shipping and freight costs) and market factors (e.g., smaller market size).

Figure 11: Normalized room air conditioner prices for 3.52 kilowatt unit in 11 focus countries



Room AC prices vary among study countries, with consumers in Barbados, Grenada, and Argentina paying most for room ACs. On average, cooling-heating room ACs are more expensive than cooling-only room ACs. (Source: CLASP analysis. The number of distinct models used for the analysis was 1,410.)

Caption: Split ACs being manufactured. Currently Brazil and Argentina are the only countries in the region manufacturing split ACs, the most efficient type of room AC.
Photo: miss irine/AdobeStock

41 In Argentina, the current government is seeking to "liberalize" the market, which can help create a more competitive market. Allowing the importation of room ACs with competitive prices can lead to lower product prices on average.

04 Low-efficiency room air conditioners

4.1 Market-based evidence

Low-efficiency room ACs are a significant presence in LAC markets. In 2023, there were nearly 4.3 million low-efficiency units sold across nine of the 11 LAC focus markets, representing 52% of total regional sales.[42] In the remaining two markets, Colombia and Uruguay, seasonal efficiency information is not included on room AC units; thus, these countries are excluded from the low-efficiency analysis.

In 2023, more than 70% of total room AC sales in Argentina, Mexico, Panama, and the Dominican Republic were low-efficiency units (Figure 12). These low-efficiency units are both imported (in Mexico, Panama, and the Dominican Republic) and locally manufactured (in Argentina).

Similar trends are likely to be occuring in Chile, Jamaica, and Barbados based on the distribution of efficiency levels for room ACs with known efficiencies. However, limited efficiency information at the point of sale prevented a precise assessment of those markets.[43]

Of the nine focus countries included in this analysis, Brazil has the most efficient market with the highest proportion of sales that meet global benchmark levels. Over half (55%)[44] of units there are efficient, while only about a third (34%) are low efficiency.[45]

Brazil's market has transformed following recent efficiency policy revisions (see Box 3) and is expected to continue this trajectory based on an efficiency policy revision scheduled for early 2026 that is expected to phase out non-inverter units.

Caption: Appliance store in Brazil where new efficiency standards have drastically increased the share of efficient units on the market.
Photo: Fernando Luiz Costa de Souza/CLASP

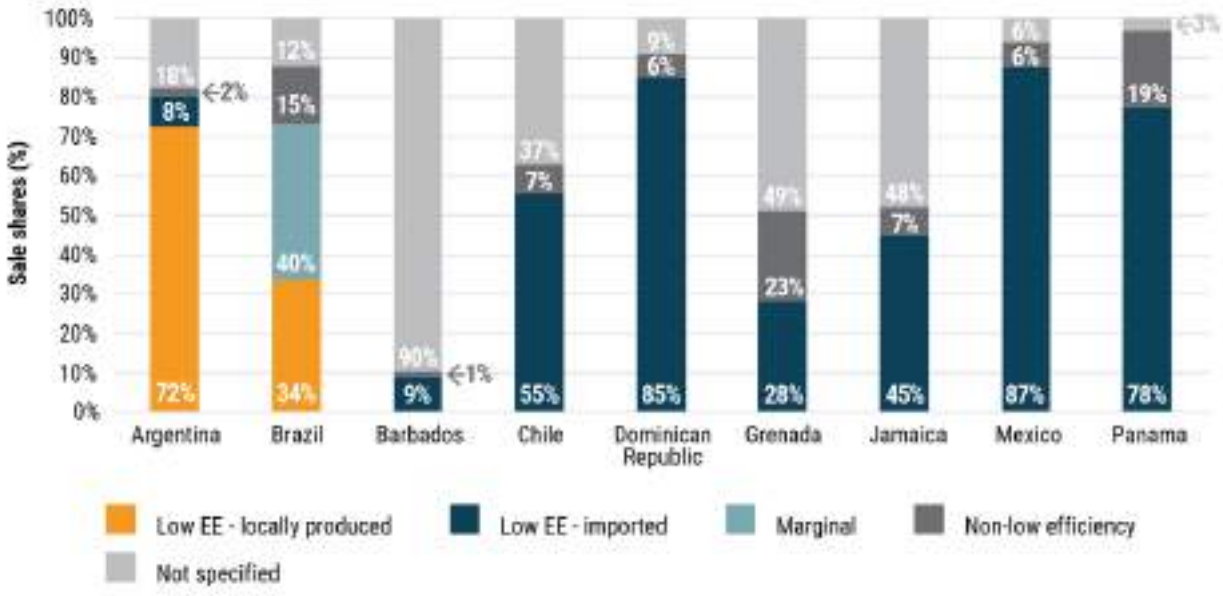
42 Total sales in 2023 (8.1 million) include 11.76% of sales for which the authors do not have efficiency data and therefore cannot categorize as low efficiency; it is likely that the percentage of total sales that were low efficiency in 2023 is higher than 72%.

43 In Chile, the efficiency level is not reported on the energy label. In Jamaica and Barbados, the products do not display efficiency at the point of sale either due to insufficient compliance or the voluntary nature of the label.

44 This number includes marginal units, or units within 5% of the global benchmark level. Marginal categorization was used for units sold in Brazil because of the slight difference in test conditions between the traditional ISO 16358:2013 test method and Brazil's test method, which was modified by introducing criteria in Ordinance No. 179 for using 29 °C test point at partial load conditions.

45 The remainder of room AC sales in the market (13%) lack sufficient information to enable a determination on the room AC efficiency levels.

Figure 12: Low-efficiency room air conditioner sales for nine of 11 focus countries, with imported and domestically manufactured shares indicated (2023)



Low-efficiency room ACs dominate the focus country markets, except for Brazil, where low-efficiency sales were estimated at 34%. The "low EE locally manufactured" category includes units manufactured domestically by multinational companies. "Low EE – imported" includes units that are imported, both by locally headquartered companies and by multinational companies. "Marginal" units are expected to meet the global benchmark level but may have lower declared efficiencies due to differences in test requirements compared to the international standard (estimated within 5%). "Non-low efficiency" are units with efficiency above global benchmark levels. "Not specified" represents units for which efficiency information is lacking. The estimated distribution of efficient units in the region is based on a sales-weighted market analysis. (Source: CLASP analysis. The number of distinct models used for the analysis was 565, and the volume of room ACs on the market used for the analysis was 8,141,272)

Box 3: Brazil: A champion of efficiency policies for room air conditioners

In 2020, Brazil implemented new room AC energy efficiency standards that accelerated market adoption of high-efficiency inverter technology. This was the first mandatory efficiency policy in Brazil based on the seasonal performance metric (CSPF), which captures the efficiency benefits of inverter room ACs. In the same year, Brazil also revised the efficiency labeling scale to better distinguish the highest-performing products in the market, as most room ACs bear an "A" label, representing the highest efficiency class.

In response to the revised labeling scale, both multinational and local manufacturers, which collectively manufacture locally nearly all new room ACs sold in the country, shifted to manufacturing more efficient room ACs to meet the more stringent labeling levels. Over several years, the share of room ACs using inverter technology has grown significantly, from an estimated 30% market share in 2019 to 65% in 2023, as consumers have been able to more easily identify better-performing products.

In 2025, Brazil has the most efficient room AC market among LAC focus countries, with over 55% of the units with known efficiencies performing at or above the global benchmark level.

Beginning in 2026, Brazil will further raise its energy efficiency levels, an improvement that is expected to eliminate most non-inverter room AC units from the market.

In response to this efficiency policy revision, manufacturers are producing better-performing room ACs for the Brazilian market while actively pursuing further improvements in product efficiency. However, challenges and delays persist, largely due to Brazil's local content requirements and challenges with local component suppliers, both of which continue to impact supply chains for room AC production.

Brands and sources

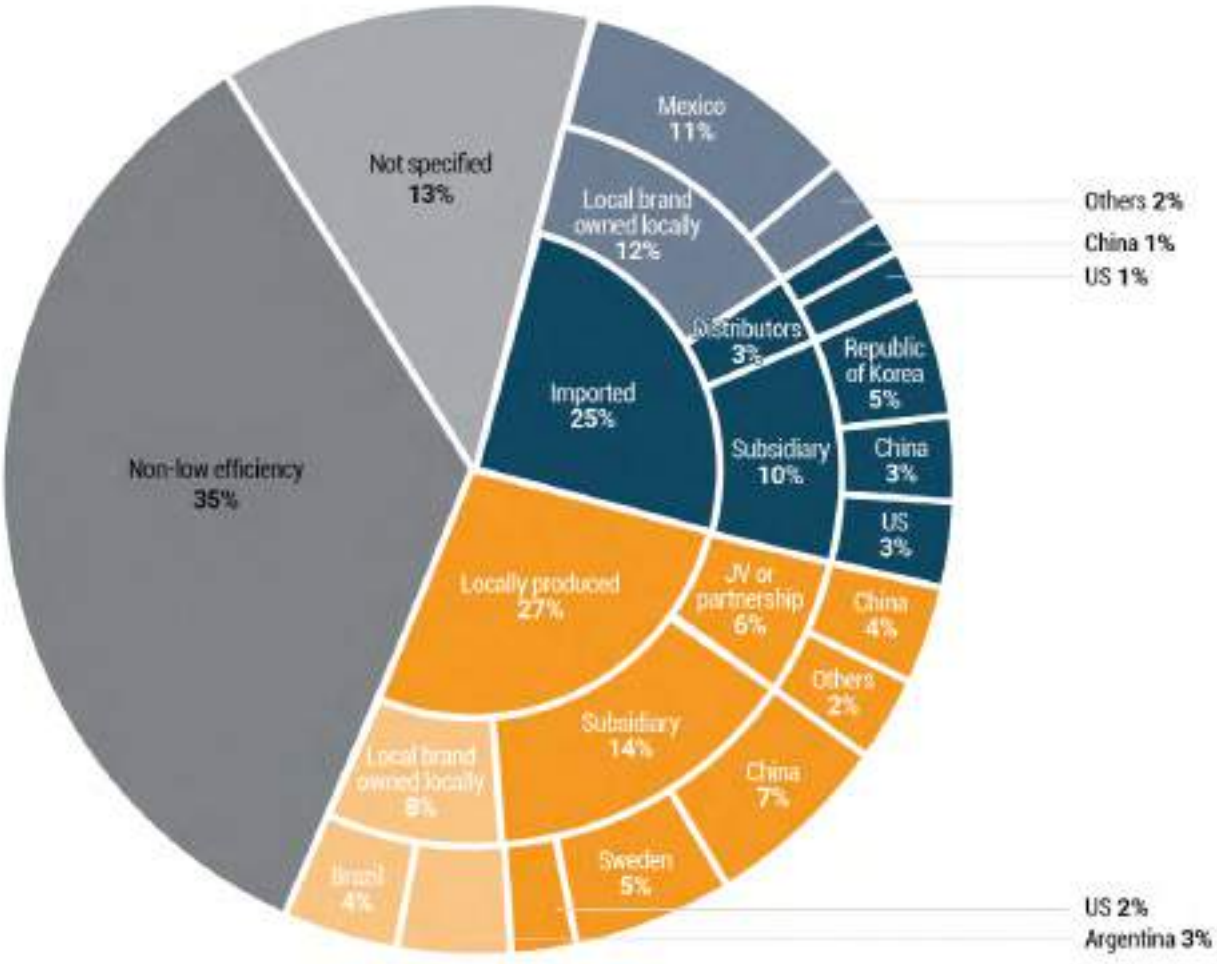
Of all room AC units sold in the 11 focus countries, just over half (52%) are low efficiency. Of these, the majority (85%) are considered to arise from environmental dumping.

Some room ACs that are considered environmental dumping are imported (57%) by multinational companies (through subsidiaries or distributors) or by local companies who rebrand OEM-manufactured room ACs. Others are locally manufactured (43%) by multinational companies through subsidiaries (an arrangement that is most common in Brazil) or joint ventures (an arrangement common in Brazil and Argentina).

A small percentage (8%) of low-efficiency room ACs are manufactured locally by local companies and are not considered dumping, and the remaining 13% of units had insufficient information to analyze.

Chinese and Korean brands dominated the LAC room AC market, while US and Swedish brands held smaller shares.[46] Together, these multinational brands accounted for 54% of known low-efficiency unit sales (Figure 13). Local brands with significant market presence [e.g., Elgin, Philco, and Aggrato (Brazil); Mirage, Mabe, and Prime (Mexico); and BGH (Argentina)] also sold low-efficiency units, either manufactured locally or rebranded from imported OEM products.

Figure 13: Sources of low-efficiency room air conditioners sold in nine countries in Latin America and the Caribbean[47]



Low-efficiency units are both locally manufactured and imported. Overall, 85% of low-efficiency units are considered environmental dumping. Of these, 43% were locally manufactured and 57% imported. Other low-efficiency units were manufactured locally by local companies and are therefore not considered environmental dumping. (Source: CLASP analysis. Number of distinct models used for the analysis was 565, and the volume of room ACs on the market used for the analysis was 8,141,272.)

46 CLASP identified over 50 unique brands across nine markets.
47 JV stands for joint venture.

Efficiency analysis

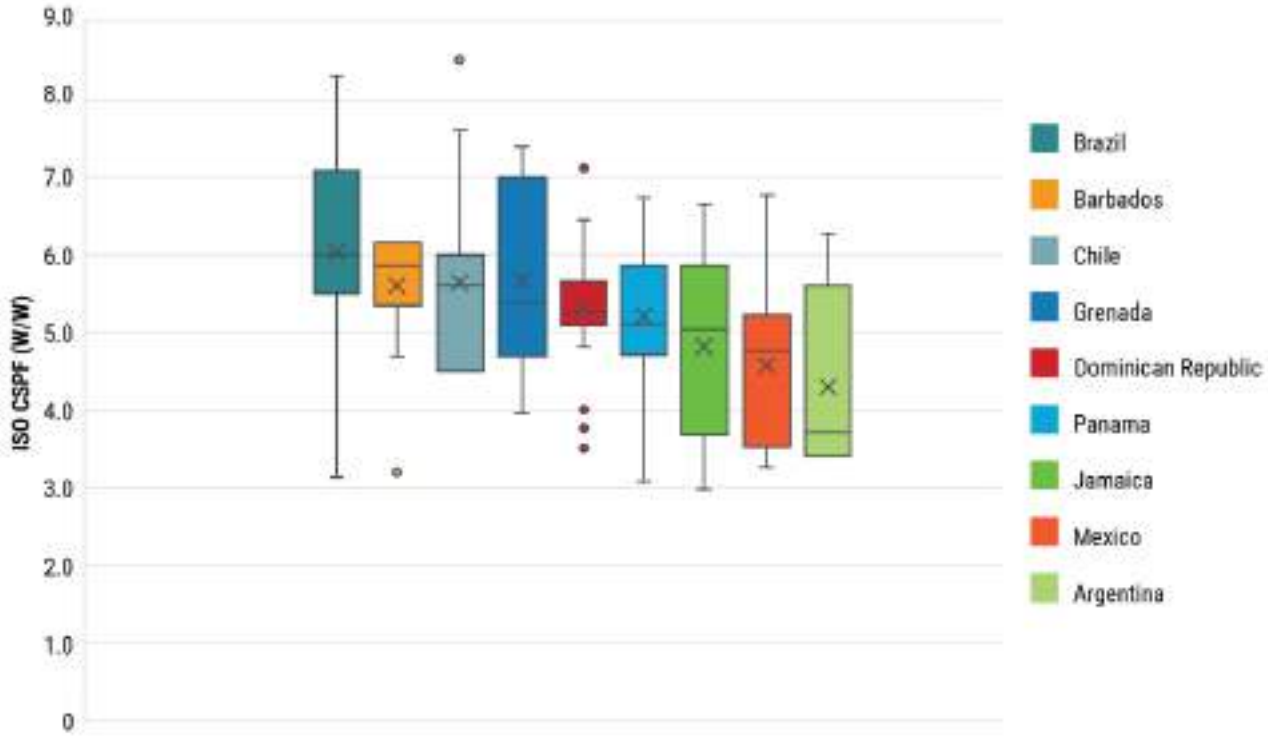
Across the nine room AC markets, the Brazilian market has the highest proportion of efficient room AC sales. The median efficiency in the Brazilian market is CSPF 6.0 Wh/Wh, making it the most efficient market in the region (Figure 14). In other countries, median efficiencies tend to hover at or above CSPF 5.0 Wh/Wh. Argentina's market is the least efficient, with a median efficiency at CSPF 3.71 Wh/Wh.

On average, inverter room ACs are more efficient than non-inverter room ACs. For the nine markets with available seasonal efficiency information at the point of sale,[48] the median efficiency of inverter units was CSPF 5.50 Wh/Wh compared to CSPF 3.50 Wh/Wh for non-inverter units. However, over half (62%) of low-efficiency unit sales in 2023 across nine markets were inverter room ACs, indicating that the presence of inverter technology does not guarantee that units will be high efficiency.

The majority (80%) of room ACs exported from China to nine of the 11 focus countries in 2023 did not meet China MEPS (which are equivalent to the global benchmark level), classifying them as environmental dumping.[49] These units are exported from China by companies headquartered in China, the Republic of Korea, the US, and the LAC region (Mexico, Jamaica, Chile, and Panama) that either have manufacturing facilities in China or contract with manufacturers there to manufacture room ACs.

Among room AC exports from China to LAC markets, over 80% of units imported by brands headquartered locally [i.e., those headquartered in Chile, Jamaica, Mexico, and Panama (87%) and over 90% of brands headquartered in China (91%), the Republic of Korea (94%), and the United States (94%)] did not meet the global benchmark level, as shown in Figure 15.

Figure 14: Range of room air conditioner efficiency levels in nine countries in Latin America and the Caribbean (2023), in cooling seasonal performance factor

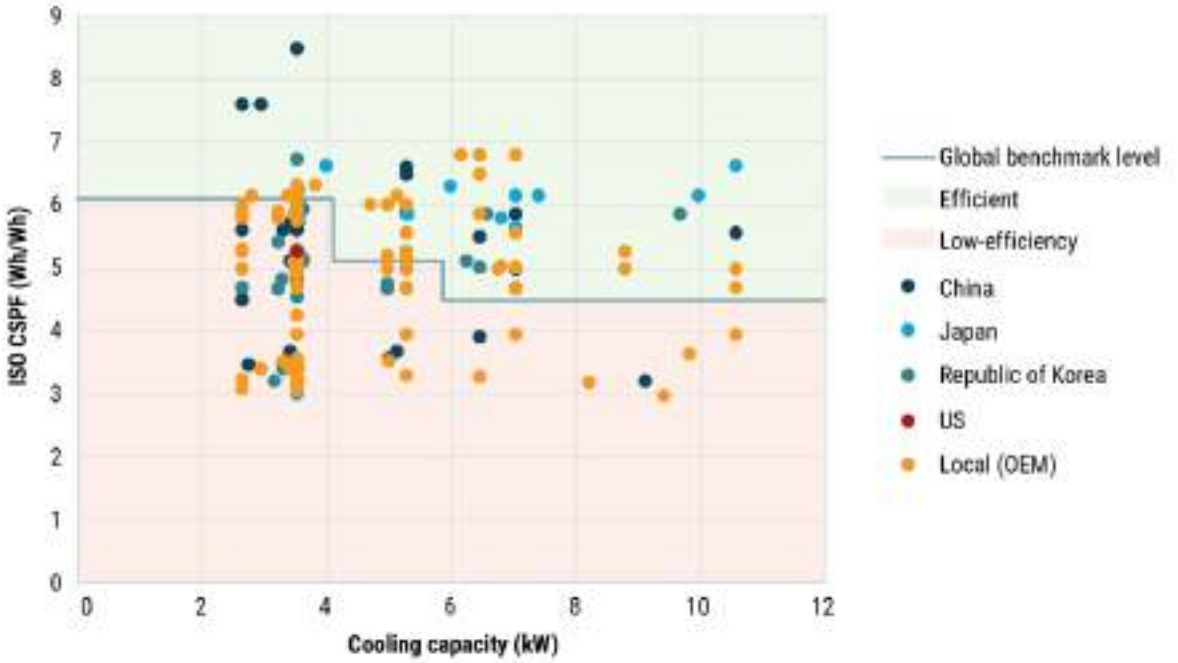


The box-and-whisker plot in Figure 14 shows the distribution of values for each category. The shaded boxes represent the interquartile range (from the 25th to the 75th percentile), with a horizontal line inside each box marking the median and an X indicating the average. The plots are arranged in order of median values. The most efficient market is Brazil (median CSPF 6.0 Wh/Wh) and the least efficient Argentina (median CSPF 3.7 Wh/Wh). Most other markets have median efficiencies above CSPF 5.0 Wh/Wh. (Source: CLASP analysis. The number of distinct models used for the analysis was 610.)

48 Even in countries where the seasonal performance metric is not part of the official regulatory framework, some suppliers reported a unit's SEER or CSPF values to facilitate sales across multiple markets. This graph presents average CSPF data for nine of the 11 focus countries where CSPF or SEER (converted to CSPF) information was available at the point of sale.

49 This percentage is different from what the UN Comtrade database reports, likely because of variations between sampled units and the broader LAC market. Comtrade data are based on HS codes that can also include import data of partial units that are counted as one.

Figure 15: Origin of companies that export room air conditioners from China, by efficiency and capacity



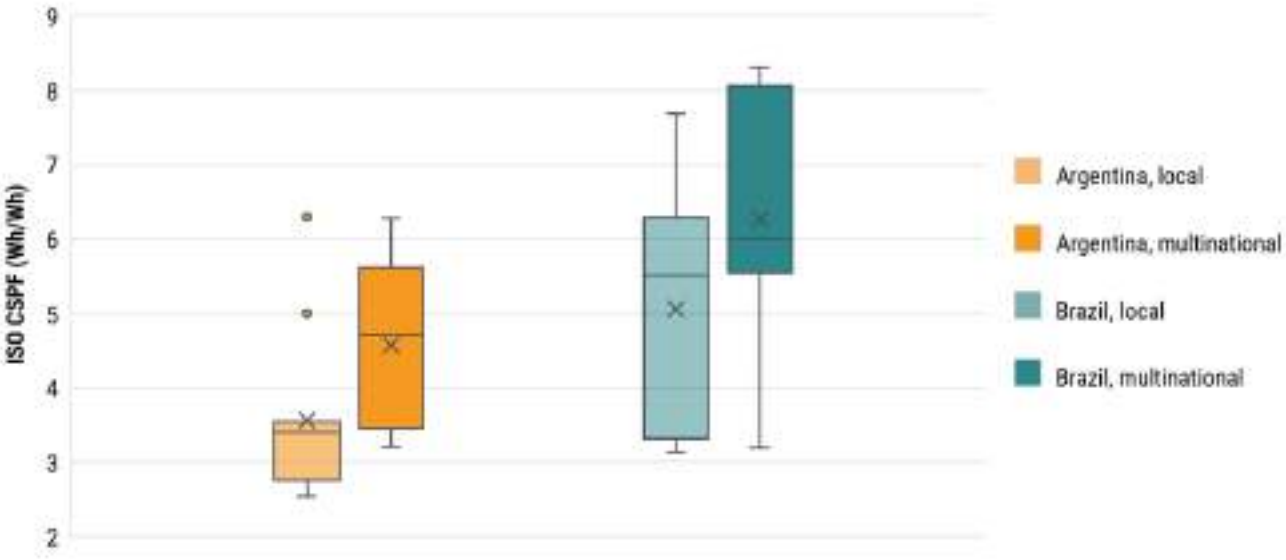
Over 80% of room ACs manufactured in China that were exported to focus countries do not meet the global benchmark level, indicating that these units are considered to arise from environmental dumping. Note that some units used for the analysis have the same capacities and efficiencies and therefore overlap in this figure. (Source: CLASP analysis. The number of distinct models used for the analysis was 368.)

Low-efficiency units are manufactured in Argentina and Brazil by both LAC-headquartered and multinational companies (Figure 16). Of the two company types, local brands offer less efficient units in both countries, on average. In Brazil, multinational companies manufacture units that are an average of 9% more efficient than units manufactured by the local companies, while in Argentina, multinational companies manufacture units that are 33% more efficient, on average.

Manufacturers in both countries use a combination of locally manufactured and imported components, mainly from China. Eligible local manufacturers have an opportunity to upgrade production lines to produce more efficient room ACs in addition to transitioning to lower-GWP refrigerants with support from the Multilateral Fund for the Implementation of the Montreal Protocol (MLF).

Although the sale of locally manufactured, locally branded low-efficiency room AC production is not classified as dumping, the presence of low-efficiency units from any source is detrimental to consumers and increases power demands and associated emissions.

Figure 16: Efficiency ranges of room air conditioners manufactured in Brazil and Argentina and owned locally or by multinational companies



On average, the room ACs manufactured in Brazil by multinational companies are more efficient than those of local brands. The least efficient units sold in Argentina are manufactured by local brands. (Source: CLASP analysis. The number of distinct models used for the analysis was 121.) The dots outside the whiskers of the plot are outliers

Brand climate commitments

The authors reviewed the publicly available climate commitments of the LAC region's eight most popular Chinese, Korean, Swedish, and United States brands. Annex 5 summarizes these commitments, providing these commitments' target years and scopes (e.g., reducing emissions throughout the value chain or in business operations only).

Six of the eight companies have made commitments to achieve carbon neutrality by 2030 (LG, Whirlpool), 2050 (Electrolux, Carrier, Samsung), or 2060 (Midea). Of these, Samsung aims to achieve net zero only in its business activities, while the rest have committed to reduce emissions from their entire value chains, including through improved product efficiencies and use of lower-GWP refrigerants.

We have not identified publicly available TCL and Gree emissions reduction targets.

4.2 The energy efficiency policy landscape in Latin America and the Caribbean

4.2.1 National policies

Appliance energy efficiency policies (i.e., MEPS and labeling programs) and their implementation and enforcement vary greatly by country.

Some countries have also recognized the importance of sustainable cooling and have developed cooling-focused national plans and strategies to help meet national targets and global commitments. A growing number of countries are including cooling-related targets in their Nationally Determined Contributions (NDCs).

See Annexes 3 and 4 for additional information on policies, plans, and strategies.

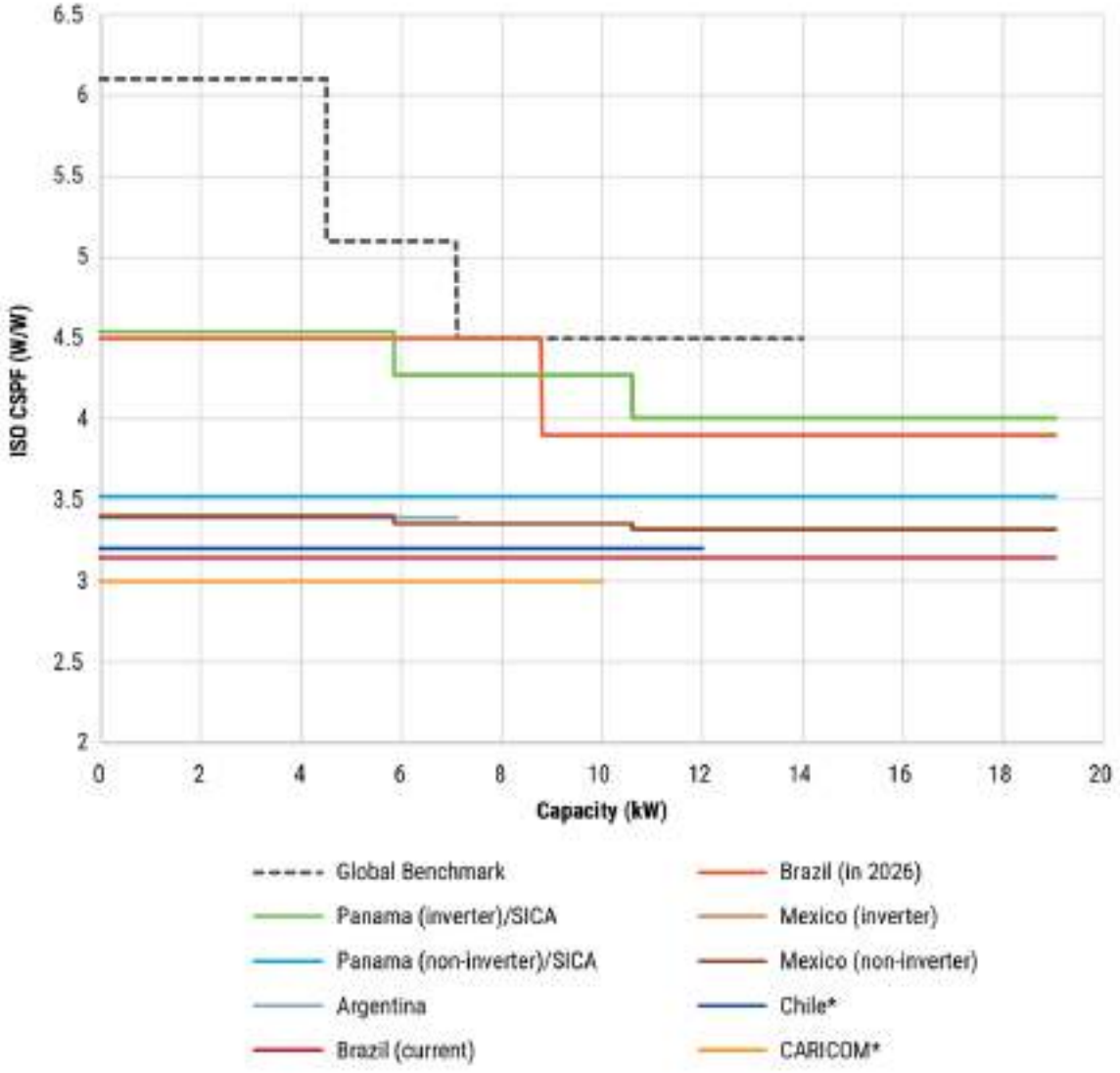
Minimum energy performance standards and labeling

MEPS for room ACs in the focus countries are relatively low, typically less than ISO CSPF 3.5 Wh/Wh. Brazil's current MEPS align with the regional average at CSPF 3.14 for all capacities, but updated standards set to take effect in 2026 will raise the bar to 4.5 CSPF for small-capacity units and 3.9 CSPF for larger ones. Panama also enforces MEPS above the regional average (its MEPS are CSPF 4.54[50] Wh/Wh), as it has adopted regionally harmonized standards for inverter ACs as established by the Central American Integration System (SICA) (Figure 17). Some countries, like Argentina, have not updated their MEPS in over a decade.

50 Converted from SEER 4.68 W/Wh.

Energy efficiency metrics vary, with Chile and CARICOM member states using the energy efficiency ratio (EER) while most others use a seasonal metric such as the seasonal energy efficiency ratio (SEER) or cooling seasonal performance factor (CSPF).

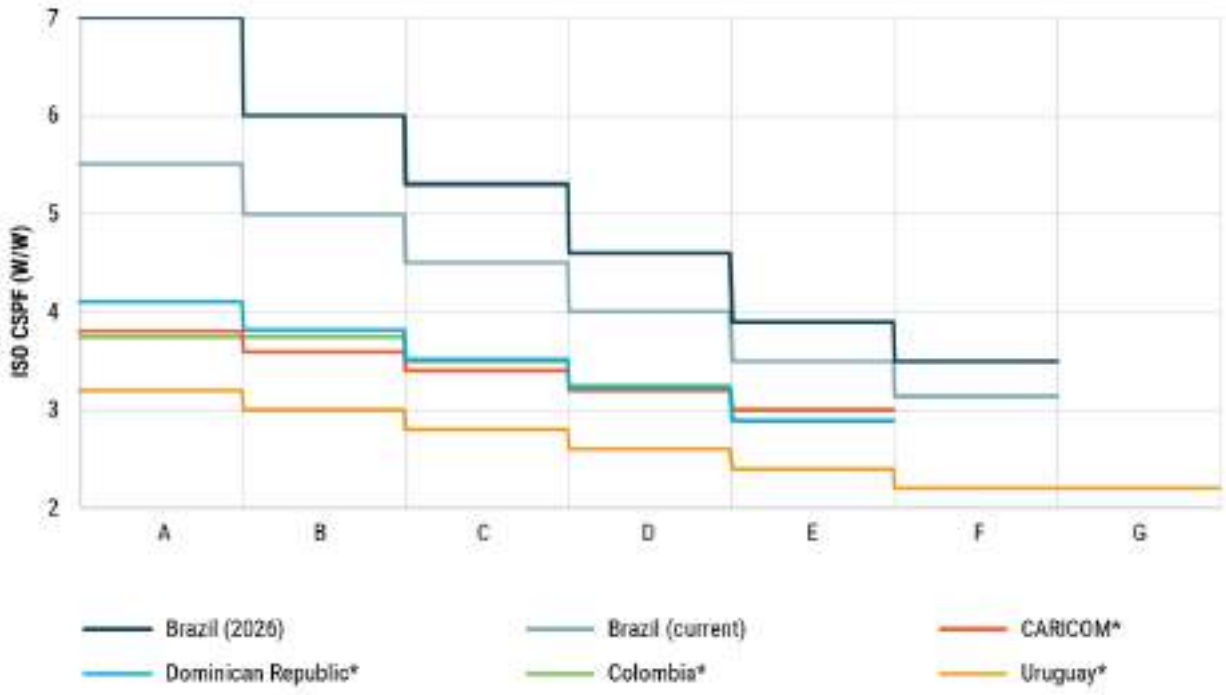
Figure 17: Current levels of minimum energy performance standards in focus countries



The EER metric is used in Chile and the CARICOM regional labeling framework. These are shown on the graph for illustrative purposes only, as EER and CSPF metrics cannot be directly compared. Under the CARICOM regional energy labeling scheme, the lowest labeling rating is considered MEPS. Countries that have adopted the regional labeling requirements include Grenada (mandatory), Barbados (voluntary), and Jamaica (mandatory). (Source: CLASP analysis)

All focus countries have mandatory or voluntary labeling frameworks for room ACs. Some countries have developed their own frameworks, while others have adopted regionally harmonized labeling requirements within SICA and CARICOM. The room AC policies of four focus countries—Uruguay, Barbados, and the Dominican Republic—cover labeling only, not MEPS, and use the EER metric for measuring room AC performance. Labeling thresholds in the LAC region are generally low (Figure 18), except in Brazil, where levels are scheduled to become even more ambitious in 2026. Some countries, like Uruguay and Colombia, have not updated their label thresholds in over a decade.

Figure 18: Energy label rating levels for selected focus countries



The EER metric (indicated by *) is used in Colombia, Uruguay, the Dominican Republic and on the CARICOM regional label, which has been adopted in Jamaica (on a mandatory basis), Grenada (on a mandatory basis), and Barbados (on a voluntary basis). As noted elsewhere in this report, seasonal and non-seasonal performance metrics, such as CSPF and EER, are not directly comparable. In this graph, both metrics are included to illustrate the relative stringency of efficiency standards across countries. Brazil's 2026 labeling levels are the most ambitious in the region. For other countries in the region, the highest labeling class (A) is set at CSPF 4.1 Wh/Wh or below. (Source: CLASP analysis)

4.2.2 Regional harmonization of room AC standards

To be considered harmonized, MEPS and labels need to be aligned on scope, test procedures, efficiency metrics, and performance levels. Harmonization enables reduced policy development costs, facilitates comparable results, streamlines customs procedures between countries, and alleviates the compliance burden and costs for manufacturers. Efforts to increase harmonization in the LAC region are being addressed within CARICOM through a regional voluntary labeling scheme and by SICA, which introduced harmonized MEPS for the region.

Photo: Fernando Luiz Costa de Souza/CLASP

05 The refrigerant transition

The global room AC market has experienced a refrigerant transition in recent decades. Between 1990 and 2010, countries around the world collectively phased out chlorofluorocarbons (CFCs), once commonly used in room ACs, to align with the ozone protection objectives of the Montreal Protocol, which was adopted in 1987.[lii] CFCs were replaced by R-22, a hydrochlorofluorocarbon (HCFC) with lower ozone depletion potential.

As environmental standards have continued to evolve, R-22 is being phased out in favor of non-ozone depleting alternatives.[liii] In its place, R-410A, a hydrofluorocarbon (HFC), became the most widely used refrigerant for room ACs globally.[liv]

However, as concerns about climate change grew, another property of refrigerants gained more attention: their impact on the climate. R-410A has a high GWP of 2,087.5, meaning that it is a greenhouse gas over 2,000 times more potent than CO_2 over a 100-year period. Under the Kigali Amendment to the Montreal Protocol, which was adopted in 2016, parties committed to transitioning toward refrigerants with lower climate impact. This prompted an increased use of R-32 in room ACs, which has a GWP of 675.[lv]

R-32 is also an HFC but is considered a transition refrigerant, as the room AC sector is seeking to adopt ultralow-GWP refrigerants such as R-290 (more commonly known as propane), which has a GWP of just 3.3. However, adoption of R-290 can be slow, arising from concerns about its flammability and safety issues encountered during installation and operation.

Table 4: Reference list of refrigerants and associated characteristics

Refrigerant	Global Warming Potential (GWP)	Refrigerant Type	Ozone Depleting Potential	Flammability	Toxicity
R-22	High (1,810)	HCFC	0.05	None	Lower
R-410A	High (2,087.5)	HFC (blend)	0	None	Lower
R-32	Lower (675)	HFC	0	Lower	Lower
R-290	Ultralow (3.3)	HC	0	Higher	Lower

For this research, the authors used 100-year GWP values from Annex F of the Kigali Amendment to the Montreal Protocol. These values can be accessed through UNEP's OzonAction GWP-ODP Calculator: https://www.unep.org/ozonaction/resources/gwp-odp-calculator-mobile-app/gwp-odp-calculator. (Sources: ASHRAE and UNEP, "Update on New Refrigerants Designations and Safety Classification;" [lvi] US EPA, ORD, "IPCC AR4, AR5, and AR6 20-, 100-, and 500-Year GWPs" and California Air Resources Board [lvii]

5.1 Refrigerant transition in Latin America and the Caribbean

Room AC markets in the LAC region reflect these global transitions. No sales of R-22 units were found in any focus study market.[51] Brazil leads the market in the transition to R-32. In 2023, units with R-32 comprised 75% of all sales there; by 2025, over 95% of room ACs sold used R-32. By comparison, in Argentina—the only other country that manufactures room ACs for its local market—only 3% of all sales in 2023 used R-32, a figure that grew to just 8% in 2025.

There are several potential explanations for this disparity. One is that manufacturers in Brazil (particularly multinational companies that manufacture locally, which tend to transition to novel technologies and processes faster than their local counterparts) may have better access to new technologies and increased ability to invest in upgrading production lines compared

51 UN Comtrade data indicate that most refrigerants shipped to the focus countries originate in China or the US, with refrigerants exports increasing from China in recent years. While imports are not differentiated by end use in reported data, it is assumed that broader refrigerant import trends can be assumed for room AC refrigerants.

to their counterparts in Argentina. Another factor is that Brazil introduced various strategies to move markets away from obsolete refrigerants (Box 4). This indirectly drives a refrigerant transition as part of the broader technological shift, as the vast majority of room ACs that meet the country's efficiency requirements contain R-32. In Argentina, recently approved MLF funding will support the transition of room AC production lines from R-410A to R-32 for six local manufacturers.[52] The transition is expected to be complete by the end of 2028.

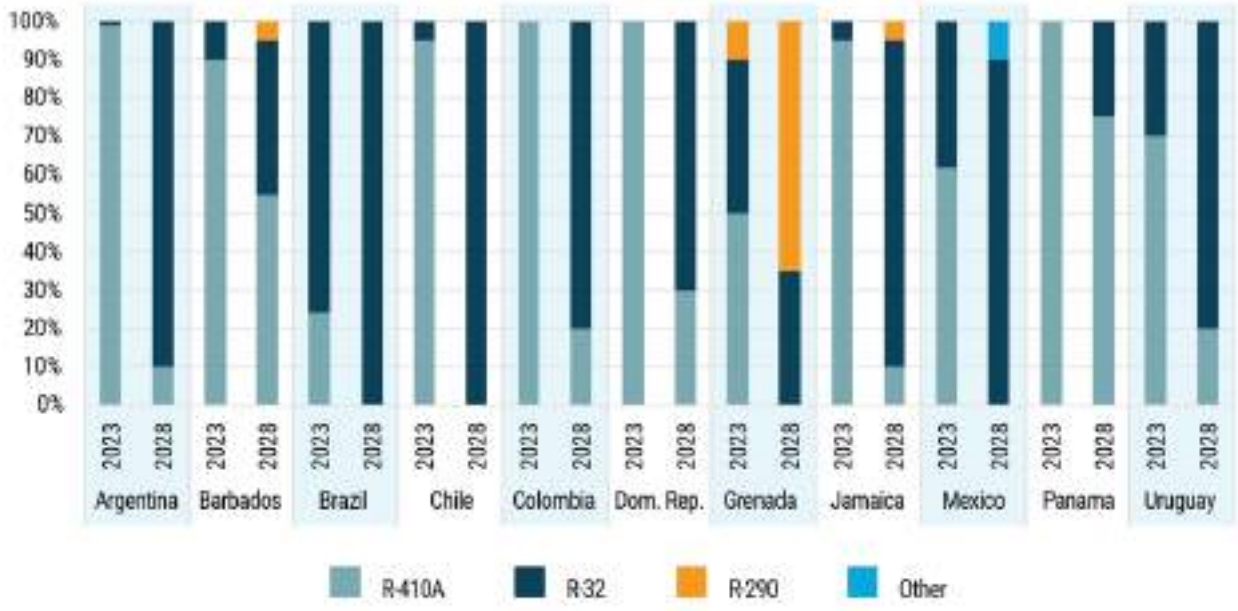
In other countries in the LAC region, where room ACs are primarily imported, R-410A continues to dominate the market, ranging from 50% of sales in Grenada to 100% of sales in Colombia, the Dominican Republic, and Panama. As of 2025, imports to the region are broadly dominated by R-410A (78%), but some brands are introducing R-32 into their product portfolios. See Annex 6 for additional details.

On average, room AC units that use R-32 are more efficient than those that use R-410A, with a median efficiency of CSPF 5.53 Wh/Wh compared to CSPF 4.83 Wh/Wh for R-410A units. However, climate-friendly refrigerants and high efficiency are not always linked; some R-32 units are low efficiency. In 2023, 91% of units sold with R-410A fell into the low-efficiency category, as did 40% of R-32 units and 38% of R-290 units.

The market share of R-32 in the LAC region has been growing and is expected to continue increasing in the coming years. Most focus countries are anticipated to transition to primarily R-32 room ACs within the next five years to align with their Kigali Amendment commitments (Figure 19), especially as production is scaled and prices for R-32 units become competitive with less-efficient R-410A units.[lviii]

The next stage of this transition is expected to be to R-290, although this change is not expected to take hold in the region in the coming years. An exception is Grenada, where significant efforts are being made to accelerate the transition to R-290. See additional information in callout Box 5.

Figure 19: Refrigerant transition: 2023 sales versus forecasted 2028 sales



In Brazil, R-32 dominates production; in Argentina, R-410A dominates imports and local production. The share of R-32 is expected to grow in all focus countries. (Source: BSRIA)[53]

52 One manufacturer, Carrier, has started the manufacture of room ACs with R-32 in Argentina and will complete the full transition of production lines to R-32 with its own resources.
53 Per BSRIA, other refrigerants primarily include R-454B, which is one of several low-GWP transitional blends under 750 GWP containing hydrofluoroolefins (HFOs).

Box 4: Brazil's successful transition to R-32 in room air conditioner manufacturing and market

In recent years, the Brazilian government has taken laudable, significant steps to shift the domestic market away from obsolete refrigerants. These efforts include:

1. **Formalization of phasedown and phaseout documentation:**
   Brazil has released several strategic documents to support the phasedown and phaseout of climate-harming refrigerants. Among them are the HCFC Phaseout Management Plan (HPMP), with Stage 3 approved in 2024, and the Kigali Implementation Plan (KIP), which is under preparation as of August 2025. Designed to align national actions with global climate commitments, these plans provide a clear and actionable framework for advancing the country's refrigerant transition.[lix]

2. **Monitoring and transparency:**
   The country created monitoring and transparency initiatives to track HCFC and HFC consumption. This includes refrigerant import tracking data, managed by the Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA), which provides annual data on HCFC imports and exports.[lx]

3. **Technical capacity-building:**
   Brazil has prioritized capacity-building to ensure safe refrigerant handling by service technicians. One notable initiative is the Training of Trainers program, which equipped 27 instructors from five regions across the country with updated knowledge on safety protocols and best practices for handling low- and ultralow-GWP refrigerants.[lxi] These efforts have strengthened national expertise, ensuring that technicians understand the environmental advantages of these refrigerants and are prepared to safely install and maintain systems that use them.

4. **Import controls:**
   IBAMA sets import controls and quotas to manage the flow of restricted refrigerants into the country. Since Brazil does not produce these substances domestically, import controls represent an effective way to manage the supply of ozone-depleting substances (ODS) in the country.

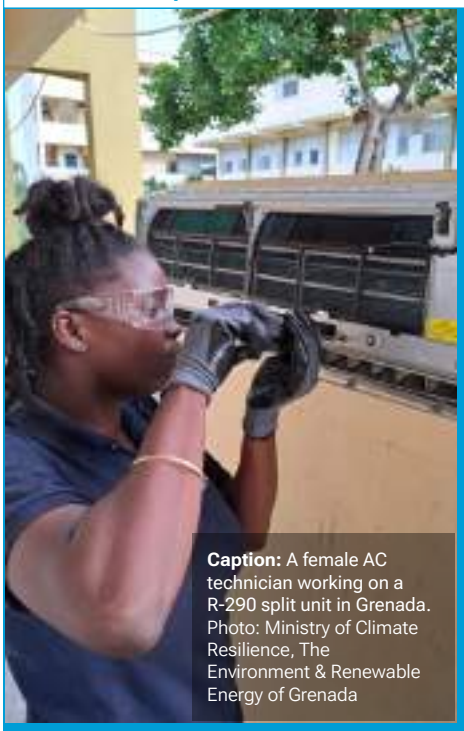
As a result of these strong efforts to advance the refrigerant transition in the country, there have been significant changes in the room AC refrigerant market. Sixty-two percent of all room AC models added to Brazil's National Institute of Metrology, Standardization, and Industrial Quality (better known as Inmetro) registry in 2020 used a high-GWP refrigerant, R-410A. By 2024, only 9% of all units added to the registry used this refrigerant, which has been largely replaced in the country by a more climate-friendly alternative, R-32.

Brands and sources of R-32 room ACs

The availability of room ACs with R-32 varies by country. All multinational brands in Brazil have R-32 room ACs in their portfolios, while in Argentina only Midea offers R-32 units (Annex 6). In focus countries that import room ACs, both multinational and local brands offer R-32 units.

No brands were found to still sell R-22 room ACs in the 11 focus countries, suggesting that the transition away from ozone-depleting refrigerants is approaching completion in the region.

Box 5: Grenada pioneers market transformation to climate-friendly room air conditioners



Caption: A female AC technician working on a R-290 split unit in Grenada. Photo: Ministry of Climate Resilience, The Environment & Renewable Energy of Grenada

Since 2005, Grenada has been actively preparing its market and consumers for the introduction of room ACs using the ultralow-GWP R-290 refrigerant to move the market toward more environmentally friendly technologies. The country began by installing 30 units under pilot projects before successfully importing and installing the first R-290 room ACs on a commercial basis in 2019.[lxii]

To build confidence among manufacturers, importers, and consumers and ensure the market was ready for the refrigerant, Grenada implemented a series of strategic steps:

1. **Capacity-building and training:**
Grenada provided specialized training for installers on the safe and proper handling of flammable refrigerants. To date, over 80% of the room AC installation workforce has received this training. The country also established a regional training center on handling flammable refrigerants, which is accessible to local technicians, technical colleges, and professionals from across the region.

2. **Development of a national code of practice:**
A comprehensive code of practice for refrigerant handling was introduced, outlining strict safety requirements and updated institutional procedures for the installation and maintenance of room ACs using flammable refrigerants.[lxiii]

3. **Stakeholder engagement and awareness:**
Awareness campaigns, including a Green Cooling Communication strategy, targeted at importers and consumers were launched to educate stakeholders about the benefits and safety of R-290 refrigerant-based room ACs.

Following the successful implementation of these measures, manufacturers started supplying R-290 room ACs to distributors in Grenada. The government further supported market adoption by eliminating import duties on R-290 units, making them cost-competitive with room ACs using higher-GWP alternatives. Additionally, some importers introduced consumer rebates to further incentivize uptake. As a result of these coordinated efforts, the market share of R-290 room ACs in Grenada reached 10% by 2023 and is projected to grow to 65% by 2028.[lxiv] Grenada has emerged not only as a regional leader but also as one of the global frontrunners in transitioning to climate-friendly room air conditioning technologies.

5.2 Refrigerant agreements and policies

Overview of global agreements

In 2016, the Parties to the Montreal Protocol adopted the Kigali Amendment, which extends the Montreal Protocol's focus on ODS and requires the gradual phasedown of HFCs. Under the Kigali Amendment, Montreal Protocol parties are required to gradually reduce HFC use by 80-85% by the late 2040s. This starts with a production and consumption freeze followed by reductions, with different phasedown schedules.

Caption: MOP36 in Bangkok, Thailand where countries met to review progress under the Montreal Protocol and advance actions to phase down harmful substances such as high-GWP refrigerants.
Photo: IISD/ENB

For Article 5 Group 1 Parties, [54] which include all LAC countries included in this study, the refrigerant production and consumption freeze started in 2024, with a 10% CO_2e reduction compared to the baseline in 2029, followed by a 30% reduction by 2035, 50% by 2040, and 80% by 2045. To comply with this phasedown schedule, most focus countries have licensing and quota systems in place to manage the importation of HFCs. As a result of Kigali Amendment implementation, R-32 has been gaining prominence both globally and in the LAC region, though it is considered a transitional refrigerant that is scheduled for phasedown under the Kigali Amendment.

Country-level efforts

All 11 focus countries have implemented HCFC Phaseout Management Plans (HPMPs) to comply with the Montreal Protocol. These plans have included policy measures, technical support, capacity-building, and public awareness efforts to support the transition toward low-GWP refrigerants.

Ten of the 11[55] focus countries have ratified the Kigali Amendment, and six focus countries have developed or are developing Kigali Implementation Plans (KIPs), which are strategic national plans to implement the Kigali Amendment that usually include legislative measures, policy and regulatory measures, a phasedown schedule, capacity-building and technology support plans, and refrigerant monitoring and reporting scheme plans. Mexico, Grenada,[lxv] and the Dominican Republic have proposed KIPs, which the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol subsequently approved,[lxvi] and Argentina, Chile, and Brazil[lxvii] are developing KIPs. Uruguay and Barbados[lxviii] are beginning the KIP development process, but have yet to officially publish their documentation.

In addition to efforts to fulfill Kigali Amendment obligations, some countries have introduced other cooling-sector policies or programs. Brazil, though still developing its KIP, includes HFC reduction targets in its NDCs, aiming to cut net greenhouse gas (GHG) emissions by 59–67% below 2005 levels by 2035.[lxix]

Grenada's National Cooling Action Plan highlights a further shift to near-zero-GWP refrigerants like R-290, with a planned ban on refrigerants with a GWP of 10 or above and a target to predominantly use hydrocarbons for cooling between 2041 and 2050.[lxx] The country's draft legislation banning room ACs with refrigerants GWP greater than 750 is awaiting vote in the parliament. Uruguay's energy label registry, though based on unverified importer data, shows a growing shift from R-410A to lower-GWP refrigerants such as R-32.

Multilateral Fund support for refrigerant transition efforts

All 11 focus countries are Article 5 (A5) Parties under the Montreal Protocol and are eligible for support from the Multilateral Fund for the Implementation of the Montreal Protocol (MLF), which covers costs incurred by countries for activities supporting the refrigerant transition, including the development of policies, standards and regulations; technical assistance to promote refrigerant containment, industry conversion, and capacity-building of technicians; promotion of alternative technologies through demonstration projects; and activities to promote adoption of low-GWP alternatives.[lxxi] Since its launch, the MLF has funded over 10,070 projects in 144 A5 countries,[lxxii] contributing to the phaseout of 756,000 metric tons of ODS and demonstrating the success of frameworks like MLF in advancing the refrigerant transition.

A large share of MLF funding supports the development and implementation of HPMPs and KIPs, managed by the Montreal Protocol Implementing Agencies UNEP, UNDP, UNIDO, and the World Bank. Argentina and Mexico currently have the most approved MLF funding among the focus countries (see Annex 7 for details). The support includes activities such as institutional strengthening; capacity-building; policy and legislative review; gender mainstreaming; adoption of low-GWP technologies; and training, enforcement, and public awareness of phasedown initiatives to help countries meet HFC phasedown targets. In addition to these initiatives, HPMPs and KIPs assist focus countries in safely and effectively transitioning to lower-GWP room AC technologies, including addressing issues relating to flammability of R-32, R-290, and other low-GWP refrigerants. These projects are laying the groundwork for the integration of low-GWP refrigerants into national room AC markets.

54 Article 5 Parties are differentiated by group to accommodate varying economic and developmental circumstances of different countries. While all LAC countries included in this study are categorized as Group 1, other A5 countries that export room ACs, such as India, may align with a different phasedown schedule, which may impact available room AC imports for LAC countries.
55 Jamaica is the only focus country that has not yet ratified the Kigali Amendment.

The MLF supports and funds National Ozone Units (NOUs), which are the government units responsible for helping ensure compliance with Montreal Protocol obligations and managing national phasedown programs to align with the Montreal Protocol, KIPs, and HPMPs.[lxxiii] NOUs carry out a wide range of responsibilities, from overseeing data collection and reporting to guiding and supporting projects funded by the MLF. They also play an important role in shaping refrigerant policy and regulations, coordinating efforts across governmental bodies, and implementing technician training programs. United Nations Environment Programme (UNEP) OzonAction also helps government and industry stakeholders in Article 5 countries meet their Montreal Protocol compliance obligations through capacity-building, technical assistance, and policy support.

Air conditioner manufacturers in the focus countries may be eligible to access MLF funding to increase the energy efficiency of their products alongside refrigerant conversion under three new modalities. In 2024, the MLF opened a $100 million USD funding window for projects to enable eligible manufacturers to increase the energy efficiency of equipment at the same time as manufacturers convert to low-GWP refrigerants. This window is being supported with additional $40 million USD of revolving funds to scale up the adoption of energy-efficient, low-GWP technologies.[lxxiv] An additional $20 million USD supports complementary energy efficiency products, including in the servicing sector.

5.3 Room air conditioner servicing

The installation, use, operation, and maintenanceof room ACs vary among focus countries. In most countries, domestic room AC units do not typically undergo preventative maintenance, and instead are serviced only when they stop working or have reduced performance.

Refrigerant handling at servicing and end-of-life is one of the most frequently cited causes of refrigerant failure and leakage in room ACs.[lxxv] These practices vary widely between countries and technicians. NOUs conduct extensive technician training in the focus countries to improve refrigerant handling practices, including in-person workshops, online courses, and the provision of informative resources like fact sheets or educational curricula. Nonetheless, local stakeholders report that technicians are not always educated about the best ways to service a unit and may not follow manufacturer guidance for refrigerant reclamation. Where technicians are well-trained and incentivized, they often carry refrigerant recovery equipment and follow recommended practices when replacing units, resulting in minimal refrigerant venting at end-of-life; where they are not, they often directly vent the refrigerant or dispose of units without reclaiming it. Poorly trained technicians may also install units incorrectly, causing equipment malfunction and/or suboptimal room AC operation.[56]

These differences in servicing practices suggest that improved technician training protocols that align with best installation[57] and servicing practices could reduce variability in refrigerant handling outcomes.

Box 6: Women in the heating, ventilation, and air conditioning sector

Most LAC countries have adopted frameworks that support gender mainstreaming—an approach that integrates gender considerations into every step of the project planning and decision-making process to ensure equitable outcomes for all genders—in the energy or cooling sector. These efforts range from broad frameworks (e.g., in Uruguay) to the incorporation of a gendered approach in national cooling plans (e.g., in Mexico). Beyond that, several countries have implemented technician training programs targeting women in an effort to bridge the occupational gender gap (e.g., Chile).

The MLF and OzonAction, for example, also incorporate gender mainstreaming into project planning, design, and implementation. Key strategies include collecting gender-disaggregated data, ensuring inclusive planning processes, and offering technical training opportunities that actively engage women, such as in the room AC sector for service technicians.[lxxvi] For example, Chile conducted an initial diagnostic of the gender gap in the refrigeration and air conditioning sector as part of the third phase of the HPMP to phase out HCFCs.[lxxvii]

56 Some of the most common installation errors include causing mechanical damage such as punctures and installing units with piping kits that are too short for the distance that the refrigerant needs to travel. Both errors may increase refrigerant leakage over the lifetime of the unit.
57 Best installation practices can be found here: https://www.igsd.org/wp-content/uploads/2025/02/Handbook-of-Room-AC-Installation.pdf.

5.4 Safety standards

A major barrier to the accelerated adoption of low-GWP refrigerants is the health and safety risk associated with many of these substances—particularly their flammability. Many low- and ultralow-GWP refrigerants, like R-290, are classified as highly flammable, which has led to strict regulatory environments in many countries. Existing safety standards, such as building codes or other related standards, often restrict the use of ultralow-GWP refrigerants to specific applications or impose charge size limits that constrain its deployment.

To ensure that the market is ready for an accelerated transition to R-290, opportunities exist to update charge limits, expand technician training programs to safely handle flammable refrigerants, and align national building codes with international best practices.

Photo: Fernando Luiz Costa de Souza/CLASP

06

Room air conditioner access and affordability

6.1 Room air conditioner penetration and cooling access gaps

Cooling demand is unevenly distributed across the focus countries. Some countries have hot, humid tropical climates that require year-round cooling, while others are more temperate, requiring only seasonal cooling. In cooler countries, room ACs are often cooling-heating units, reducing the need for multiple temperature-regulation appliances.

Variables such as purchase price, operating costs, electricity access, and thermal comfort norms also affect room AC penetration rates across the focus countries. Regionally, no dominant penetration rate trend emerges based on income, climate, electricity price, or other socioeconomic conditions.

Fifteen percent of households in the LAC region own air conditioners,[lxxviii] and additional research finds that the lives and livelihoods of approximately 67.8 million people in the region, or 10% of the total population, are at high risk[58] due to a lack of access to cooling.[lxxix] Of the focus countries, Brazil had the largest population of high-risk inhabitants, who comprised approximately 34 million people in 2023, representing 16% of the population.

This study attempts to quantify the cooling access gap in the LAC region. The cooling access gap can be defined as the difference between the "ideal" saturation of room ACs in which everyone in need of a room AC can purchase one (a counterfactual known as the maximum saturation rate)[59] and the number of people who currently have access to cooling technologies (known as the penetration rate).

Caption: As temperatures are rising, cooling is no longer a luxury but a necessity in many of the region's hot and humid countries such as Barbados, Grenada, and Jamaica.
Photo: Kawee/AdobeStock

58 According to SEforALL, populations at high risk are those that "lack access to cooling for thermal comfort, food and agricultural produce, and medical products." This includes populations lacking access to electricity, likely living in extreme poverty. Groups at medium risk are ready to purchase cooling appliances but the available options are not sustainable and affordable.
59 Maximum saturation rate was calculated based on CLASP's Mepsy cooling degree days data, and room AC penetration rate data were obtained from various sources including BSRIA, government surveys, and interviews, and then validated. Additional information on the calculation of the climate maximum saturation is available in Annex 1.

Figure 20: Room air conditioner access gap for residential sector in 11 countries, 2023[60]

Additional information on the calculation of the access gap can be found in Annex 1. (Source: Penetration rate was estimated from a variety of sources. For countries with detailed statistical data available, the penetration rate was taken from the most recent survey on room AC ownership (Colombia, Dominican Republic, Mexico, and Panama). For countries without detailed statistical data, the penetration rate provided by BSRIA or estimated by the expert consultant was used (Argentina, Brazil, Chile, Grenada, Jamaica, and Uruguay). There is no room AC penetration data for Barbados. The regional penetration rate of 15% was assumed to be representative of the country, which was reported by the IEA in 2023: https://www.iea.org/commentaries/setting-the-standard-how-central-america-is-harmonising-energy-efficiency-for-appliances.)

This analysis found the largest access gaps in Caribbean countries (Barbados, the Dominican Republic, Grenada, and Jamaica), where over 80% of households lacked adequate cooling (Figure 20). The smallest gaps (15% or less) were observed in more temperate countries like Argentina, Chile, and Uruguay. Demand for cooling is expected to increase due to rising temperatures, increased extreme heat events, and growing incomes and urbanization.

IEA projects a rise in cooling degree days (CDDs)[61] in the LAC region from 29% to 43% between 2041 and 2060 compared to 1990.[lxxx]

60 A large access gap is identified as a gap of 50% and above.
61 CDDs are the number of days that cooling is needed over a given period, based on the assumption that when the outside temperature is 18 °C (65 °F) or lower, cooling is not needed for comfort.

Impacts of a lack of access to cooling

The impacts of a lack of access to cooling range from general discomfort and reduced productivity to increased risk of heat-related illnesses and mortality. Deaths due to heat have risen significantly in the last three decades, both globally and in the LAC region. In the LAC region, the deaths of adults 65 years old and over that can be attributed to heat exposure increased, on average, by almost 240% from 2000–2004 to 2017–2021.[lxxxi]

Drivers of cooling access gaps

Primary drivers of the cooling access gap include:

- **Room AC purchase and installation costs limit the ownership of these appliances**. There is also limited access to financial assistance (including rebates, subsidies, and incentives) for the purchase and installation of air conditioning units in the focus countries. This is discussed further in section 6.2.
- **High electricity costs** paired with inefficient equipment compound air conditioner operating costs. Related challenges include required long operating hours and poorly insulated/ventilated homes.
- **Limited or unreliable access to energy infrastructure**, especially in geographically or economically isolated areas such as low-income rural districts. For example, while Brazil has electricity coverage throughout the country, there are significant disparities in the quality and consistency of coverage for rural and Amazonian regions. In the north of Brazil, approximately 4.4% of rural residents lack access to electricity compared to 0.1% in urban locations.[lxxxii]

6.2 Cooling access gaps for vulnerable groups

Certain population groups face disproportionately higher risks from dangerous heat exposure, including older adults, children, persons with disabilities, and women—especially pregnant women.[lxxxiii] Studies have shown that children, the elderly, and pregnant women subject to high heat have impaired thermoregulation and may face increased risk of dehydration, heat stress, heat stroke, and cardiovascular events.

For pregnant women, high heat means a higher risk of hospitalization, preterm labor, maternal mortality, preeclampsia, and other dangerous complications. Exposure to extreme heat throughout pregnancy is linked to a 27% increase in the risk of severe maternal morbidity, with a 28% increase during the third trimester alone.[lxxxiv]

For children and infants, mortality rates may increase during heat waves.[lxxxv] Ninety percent of children in the LAC region are exposed to two or more overlapping climate and environmental shocks, including heat waves.[lxxxvi]

Elderly populations are also affected by heat. In the Caribbean, older people often reside in crowded substandard housing (particularly in low-income communities), making them more susceptible to heat-related health risks.[lxxxvii] Limited income and inadequate insulation exacerbate vulnerability to heat, as many households cannot afford room ACs or their operating costs.

The heightened sensitivity of vulnerable populations to heat stems from a combination of biological factors, pre-existing health conditions, and social inequalities. Vulnerable populations may experience further elevated risk due to low household incomes. Poverty drives risk, and gender, poverty, and economic inequality all influence individuals' vulnerability and adaptive capacities with respect to cooling access.[lxxxviii]

Gender and cooling access gaps

In Latin America and the Caribbean, women may be more likely to lack access to cooling than men. A stark gender pay gap between women and men in the region means that women, on average, earn 20% less than men and are less likely to be able to afford a room AC.[lxxxix] An increasing number of households are headed by women in the region, ranging between 29% and 50% in different countries.[xc] For example, the number of households headed by women in Chile grew from 20.2% in 1990 to 47.7% in 2022,[xci] and a similar trend is seen in Colombia.[xcii]

Women also bear a disproportionate burden of household labor. In many LAC countries, women spend up to three times as many hours a week on household chores. For example, in Mexico, women spend, on

average, 58.4 hours engaged in domestic labor, while men spend 17.[xciii] In the Dominican Republic, women spend approximately 31.2 hours a week on household labor, while men spend only 9.6 hours a week on average.[xciv] Since only about 15% of households in the LAC region own ACs,[xcv] women are likely to be exposed to elevated heat risks while completing domestic tasks.

Women are also disproportionately represented in informal employment[62] and have more limited opportunities for formal employment. The informal employment gender gap in the LAC region has expanded recently, leaving female formal employment rates at 52% compared to the male formal employment rate of 74%.[xcvi] In addition, domestic services are a common source of informal income for women in the LAC region, where there are about 18 million workers in this field, 93% of whom are women.[xcvii] This means that women have fewer protections from labor laws than men and may be more likely to be subject to informal working conditions lacking adequate cooling.

6.3 Cooling affordability

The lack of access to cooling services and appliances can also be understood from an affordability perspective. For the purposes of this research, the authors define energy affordability as the ability of households to meet their energy needs without sacrificing other essential expenses like food, housing, and healthcare.

The affordability of a cooling appliance can be analyzed on the basis of the appliance's lifetime ownership cost, which is composed of two primary variables: its purchase price (also known as first cost) and the cost to operate it relative to household income.[xcviii] The latter cost is determined by the unit's energy consumption and the electricity price. The financial benefits of efficient appliances—and, conversely, the financial burdens of low-efficiency appliances—are most evident when considering lifetime ownership cost.

6.3.1 Household income and room AC cost analysis

The appliance purchase cost and operating cost relative to income may be among the main constraints on room AC adoption. Low-efficiency room air conditioners may have a lower upfront cost, but their higher operating expenses can make them less affordable over time.

LAC countries covered in this study are considered middle, upper-middle, or high-income,[63] but some have large income inequalities. Brazil and Colombia have greater income inequality (with World Bank Gini indexes[64] over 0.5), while the other focus countries have moderate inequality (with Gini indexes of 0.37–0.49). Higher inequality means more households may not have the means to purchase and operate room ACs.

Room AC purchasing costs relative to median income

The cost of room air conditioners varies not only across the 11 focus countries, but also in terms of how much of the median income this cost represents. The average[65] cooling-only room AC price exceeds the median monthly income in Colombia (121%), Grenada (108%), and Jamaica (119%). For cooling-heating units, the unit price exceeds the median monthly income in Argentina (132%), Brazil (104%), Grenada (178%), and Jamaica (140%) (Figure 21). This indicates that the purchase cost of a room AC may be unaffordable for some households, particularly those below median income.

62 Informal employment can be defined as employment where, in law or in practice, the employed individual is not protected or covered by the country's labor laws. See expanded definition in the report glossary.

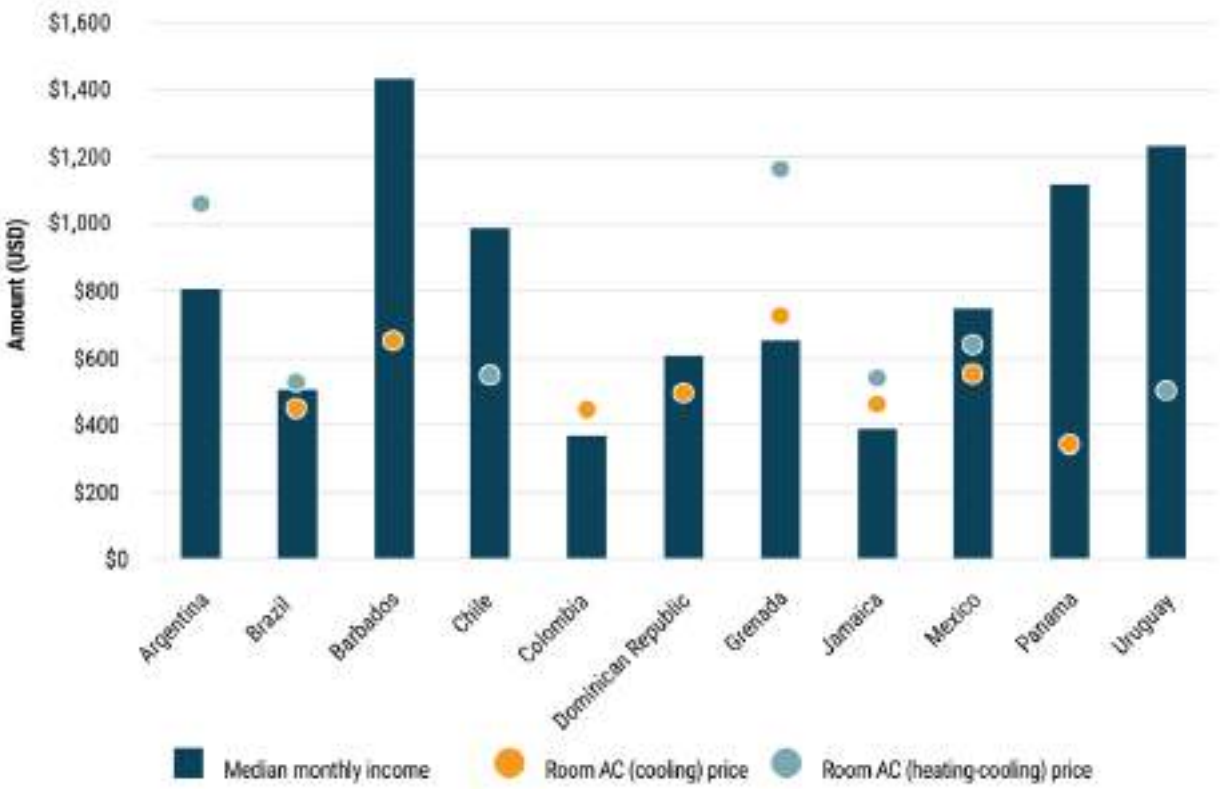
63 Gross National Income (GNI) for upper middle income countries is $4,466–$13,845 USD and GNI for high income countries is more than $13,846 USD. Classification is based on World Bank Atlas Method for FY24 based on 2022 data. World Bank Group country classifications by income level for FY24 (July 1, 2023–June 30, 2024).

64 The Gini index is a widely used measure of income inequality within a country, that ranges from 0 (perfect equality) to 100 (maximum inequality). Higher Gini index indicates greater income disparity among population.

65 Normalized average price for 3.52kW unit.

Caption: Residential building in Brazil where many do still do not have access to cooling.
Photo: Fernando Luiz Costa de Souza/CLASP

Figure 21: Median monthly income compared to average room air conditioner prices for cooling-only and cooling-heating technologies



In four countries, the room AC price is at or above the level of the median monthly income, making it more challenging for households to afford room ACs. Given that women's incomes can be, on average, 20% lower—a disparity observed across the LAC region—they may be even less likely to be able to afford purchasing a room AC. (Source: CLASP analysis)

Additionally, high installation costs, e.g., in Argentina, may prevent people from purchasing a room AC even if the purchase price is within their monthly household income. Some households may also need to replace room ACs sooner due to harsher environmental conditions, such as high salinity.

Operating costs

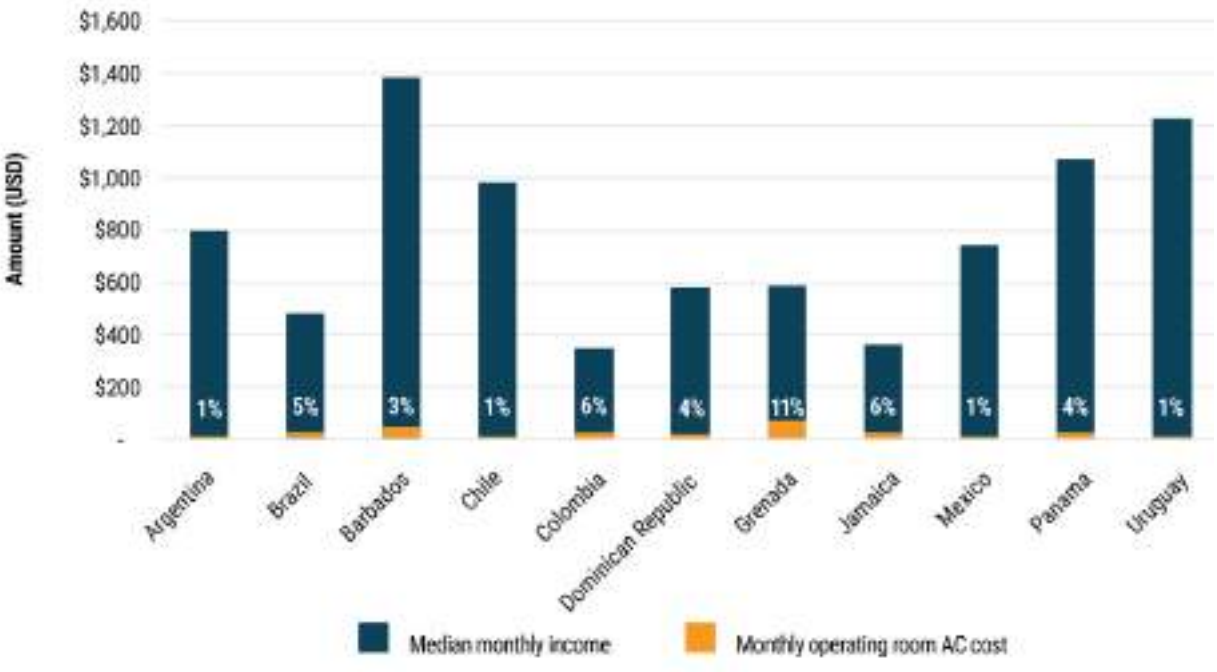
Even when households can afford to purchase a room AC, high operating costs may render room AC use unaffordable. In Latin America, average household expenditure on energy services is second only to food, indicating that energy costs represent a significant financial burden to many in the region.[xcix]

Monthly costs to operate a room AC depend on the number of hours the unit is run as well as on the country's electricity price. In countries and regions with temperate climates, room ACs operate for fewer hours, resulting in lower monthly bills. In currently moderate climates in Argentina, Chile, Mexico, and Uruguay, the average cost of running a room AC[66] can be up to 1% of median monthly income (Figure 22). In countries with higher electricity prices (e.g., Jamaica and Grenada) or countries with hot and humid climates (e.g., Panama, the Dominican Republic, and Barbados), room AC operating costs constitute a much higher proportion of a household's overall expenditures.

Grenada has the highest cost to run room ACs in the LAC region, estimated at 11% of median monthly income, followed by Jamaica and Colombia at 6%.

66 With cooling capacity of 3.52kW.

Figure 22: Monthly income and monthly operating room air conditioner costs for 11 focus countries



In six of the focus countries, the monthly room AC operating costs are 4% of median monthly income or higher. Women may need to allocate a higher share of income for running room ACs, because their incomes can be, on average, 20% lower—a disparity observed across the LAC region. (Source: CLASP analysis)

Cooling affordability for low-income people and other vulnerable groups

The affordability of operating room ACs can vary across different income levels within a country. People in the lowest three quintiles[67]—or the poorest 60% of households—may have to allocate a high proportion of their incomes to pay for the operational costs of room ACs.

On average, households in Latin America and the Caribbean spend between 7% and 9% of their monthly income on energy. Among the poorest households,[68] however, this figure often rises to more than 24% of their income.[c]

Between 2019 and 2021, the number of people living below the poverty line in the LAC region increased by 7%. This translates to 14 million people falling into poverty and paying a higher proportion of their income for electricity.[ci]

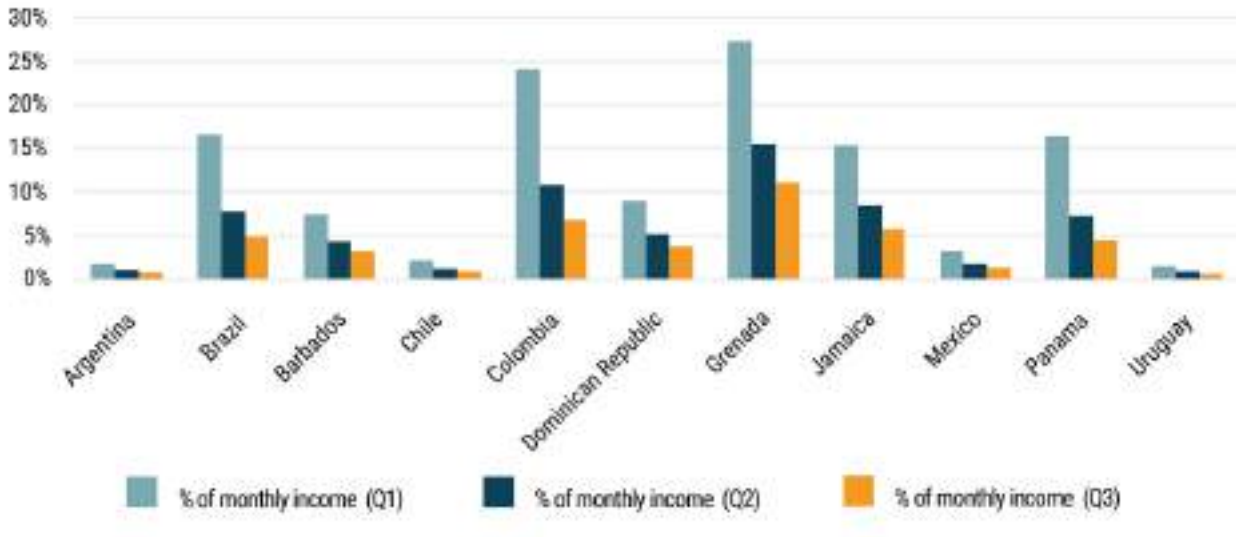
When disaggregating average monthly income by income quintiles, households in the lowest three quintiles may be expected to allocate a significant portion of their incomes to room AC operation. This can reduce resources available for other essential needs (i.e., food and education), making the households energy poor. Energy poverty, in turn, can further widen the gap between higher- and lower-income households.[cii]

The analysis showed that in 2023, the poorest 20% of the households in Brazil, Jamaica, and Panama may have spent more than 15% of their incomes on cooling, while in Colombia and Grenada, household cooling expenditures across all income levels could have exceeded 20% (Figure 23). Even lower middle-income households in these countries (accounting for 40% of all households) may have spent 6–7% or more of their incomes on cooling, making room AC ownership and use less affordable.

Room AC operation is more affordable in Argentina, Chile, Mexico, and Uruguay, where the poorest 60% of households are believed to spend less than 3% of their income on cooling. Lower relative shares of household expenditure are associated with fewer hours of room AC operation and lower electricity prices.

67 A quintile is a value that divides a set of data into five groups of equal size. In this analysis, households were divided into five groups based on their income levels. The first quintile includes the households with the lowest income and the fifth quantile, the highest. The first three quintiles group 60% of households with the lowest incomes.
68 One in 20 of the poorest households are in the bottom income quantile.

Figure 23: Household spending on cooling by quintiles (quintiles 1–3) for 11 countries



In seven focus countries, running a room AC would cost the poorest 60% of households between 3% and 27% of their monthly income. (Source: CLASP analysis)

Policy and incentive programs targeting improved access to cooling

Several country-specific programs in the LAC region target cooling access through increasing room AC affordability. Similar to programs in other regions,[69],[ciii] these include loans, on-bill or on-wage financing, and subsidies to allow households to purchase high-efficiency room ACs.

In Colombia, the Fund for Non-Conventional Energy and Energy Efficiency plays an important role in supporting energy efficiency and clean energy policy objectives through project financing and investment.[civ] From 2020 to 2022, this program replaced more than 10,150 refrigerators and ACs with high-efficiency models in low-income households.

In Mexico, the Household Appliance Replacement Program replaced 1.9 million refrigerators and ACs (all over nine years old) in low-income households from 2009 to 2012.[cv] This led to an estimated savings of 6,770 GWh, equivalent to 8% of the nation's annual residential electricity consumption. The program achieved cost recovery within about four years, saving the equivalent of $83.2 million USD in annual subsidies through avoided energy consumption.

The Brazilian Program of Energy Efficiency is an example of a long-term energy efficiency program benefiting low-income households.[cvi] Under this program, utilities must dedicate a portion of revenues to improve end-use energy efficiency. About half of these investments in energy efficiency have been directed toward low-income households. Estimates show these projects have saved an average of 6.9% of the average monthly electricity consumption for participating low-income households.

69 An example in Ghana is ECOFRIDGES, an on-wage financing mechanism. Introduced in 2019, it reduces the initial purchase cost of efficient room ACs by providing zero-interest loans for 12 months for salaried workers to help them purchase appliances that have higher upfront cost.

07 Policy impact scenarios

This section highlights the estimated GHG emissions, energy, and cost savings associated with a transition from low-efficiency, high-GWP room ACs to high-efficiency, low-GWP room ACs for all 11 focus countries in the LAC region. The analysis was conducted using CLASP's open-access impact modeling tool, Mepsy, to estimate indirect emissions and lifecycle cost savings from room AC efficiency improvements, alongside an in-house direct emissions model to assess the impact of refrigerant leakage during servicing and at end-of-life disposal. Data for both models originated from multiple sources, including BSRIA market data, on-the-ground in-store data collection, interviews with local stakeholders, and industry reports.

See Annex 1 for more information on the methodology and assumptions used for impacts modeling.

7.1 Scenarios

To evaluate the potential effects of policy change, the authors developed multiple policy scenarios based on their regional relevance, including the adoption of global benchmark efficiency levels and next-generation efficiency levels as the MEPS in all focus countries. The R-290 refrigerant transition scenario was chosen as it represents the next phase in the region's shift toward low-GWP refrigerants.

To analyze the impact of policy change, the authors defined a business-as-usual and three policy scenarios as shown in Table 5. These scenarios present different policy ambition for efficiency (scenario 1 and scenario 3) and refrigerant transition (scenario 2).

Table 5: Business as usual and three scenarios for impact evaluation

Scenarios	Energy efficiency	Refrigerant
Business-as-usual (BAU)	Current market and future projections in accordance with projected growth trends. BAU assumes no policy intervention.	Market-driven transition in refrigerants, beginning with a shift from R-410A (the dominant refrigerant in most focus countries) to R-32, followed by a transition to R-290 starting in 2035. This trajectory aligns with the HFC phasedown schedule outlined in the Montreal Protocol and is supported by ongoing technological advancements.
Scenario 1	Adoption of global benchmark MEPS for room ACs in 2027 (CSPF 6.1 Wh/Wh).	Ongoing (market-driven) transition to R-32, followed by a transition to R-290 starting in 2035.
Scenario 2	Adoption of global benchmark MEPS for room ACs in 2027 (CSPF 6.1 Wh/Wh).	Accelerated market transition to an ultralow-GWP refrigerant (R-290), which will be introduced to the market in 2029.
Scenario 3	Adoption of global benchmark MEPS for room ACs in 2027 (CSPF 6.1 Wh/Wh) and adoption of next-generation MEPS in 2029 (CSPF 7.59 Wh/Wh).	Ongoing (market-driven) transition to R-32, followed by a transition to R-290 starting in 2035.

(Source: CLASP analysis)

To quantify CO_2e[70] reductions in each scenario, the authors first modeled indirect emissions using CLASP's public-access climate impact calculator, Mepsy,[cvii] to quantify emissions reductions associated with reductions in electricity use due to improved energy efficiency. Second, the authors modeled direct emissions using CLASP's in-house direct emissions model to estimate CO_2e reductions from a shift toward ultralow-GWP refrigerant usage in room ACs.[71]

The authors then calculated consumer cost savings using a lifecycle cost (LCC) analysis method that estimates the costs of purchasing and operating the room ACs. The authors did not include refrigerant and servicing costs in this analysis, primarily because servicing is rare in the countries included in the analysis, with research indicating that units are serviced only when broken, typically less than twice over an appliance's lifetime. Further, refrigerant and servicing costs—whatever the practice—are uniform across policy scenarios, indicating that only product and performance costs are relevant for impact comparison. Changes in purchase cost were modeled for each scenario to account for potential price increases from efficiency improvements.

The authors estimated lifecycle costs for BAU and the two efficiency policy scenarios (scenarios 1 and 3). The authors then estimated the average consumer cost savings for each focus country by comparing room AC lifecycle costs under the same scenarios.

Additional modeling assumptions are listed in Annex 1.

7.2 Impact analysis

Low-efficiency room ACs are readily available across the focus country room AC markets. Without policy intervention, they are projected to result in upwards of 1,350 Mt CO_2e emissions cumulatively by 2050 (Figure 24).

Analysis of the three policy scenarios yielded the following results.

Policy scenario 1: All 11 focus countries adopt current global benchmark MEPS by 2027.

- **Climate benefits**
  The region would achieve cumulative emissions reductions of 43 Mt CO_2e between 2027 and 2050 (Figure 25), equivalent to removing one coal-fired power plant from the grid mix over a period of 20 years.[72]

- **Consumer benefits**
  Consumers would save over $20 million USD in operating costs during the same time period.

  Relatively small emissions reductions and lifecycle savings from this scenario are likely the result of Brazil, a country with a relatively high baseline efficiency, dominating the regional market.

Policy scenario 2: All 11 focus countries adopt global benchmark MEPS and begin transitioning the room AC market to R-290 refrigerant in 2029.

- **Climate benefits**
  The region would achieve cumulative emissions reductions of 63 Mt CO_2e between 2027 and 2050, equivalent to removing nearly two coal-fired power plants from the grid mix over a period of more than 20 years.

- **Consumer benefits**
  Consumers would save over $20 million USD in operating costs during the same time period.

Policy scenario 3: All 11 focus countries adopt global benchmark MEPS in 2027 and transition to the next-generation MEPS level of CSPF 7.59 Wh/Wh in 2029.

- **Climate benefits**
  The region would achieve cumulative emissions reductions of 173 Mt CO_2e between 2027 and 2050, equivalent to removing over three coal-fired power plants from the grid mix over a period of more than 20 years.

70 A carbon dioxide equivalent (CO_2e) is a metric measure used to compare the emissions from various greenhouse gases based on their global warming potential (GWP), by converting mass of other gases to the equivalent mass of carbon dioxide with the same global warming potential. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Carbon_dioxide_equivalent

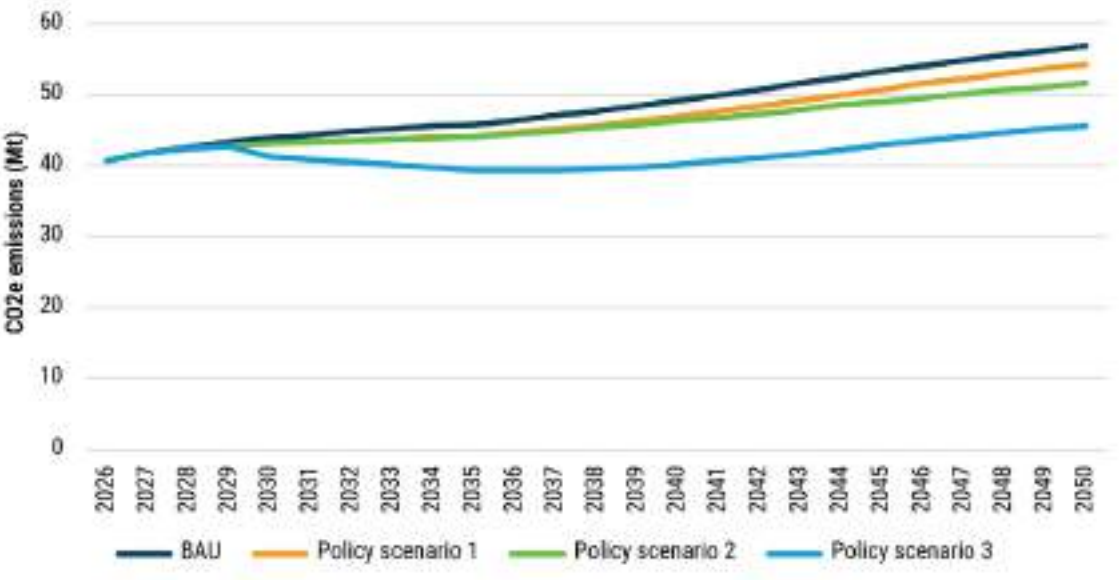
71 For direct emissions, the authors used GWP 100-year values as reported in the Kigali Amendment. Additional information on direct emission modeling is available in Annex 1.

72 Assumes continuous running at 500-megawatt capacity at 50% load factor with 34% efficiency and a carbon emission factor of 95.52 kg CO_2/mmBtu, where annual emissions stay constant year-on-year.

- **Consumer benefits**
  Consumers would save over $105 million USD in operating costs during those years.

In each scenario, results indicate that these benefits are particularly concentrated in focus countries with long room AC usage periods and high energy costs (such as the Caribbean nations), indicating that consumers in these nations may benefit most from improved efficiency policies for room ACs. However, in countries that are currently more temperate, room ACs may be replaced by more efficient reversible heating-cooling technologies, potentially leading these benefits to be even higher, as this analysis does not capture efficiency gains in the heating cycle.

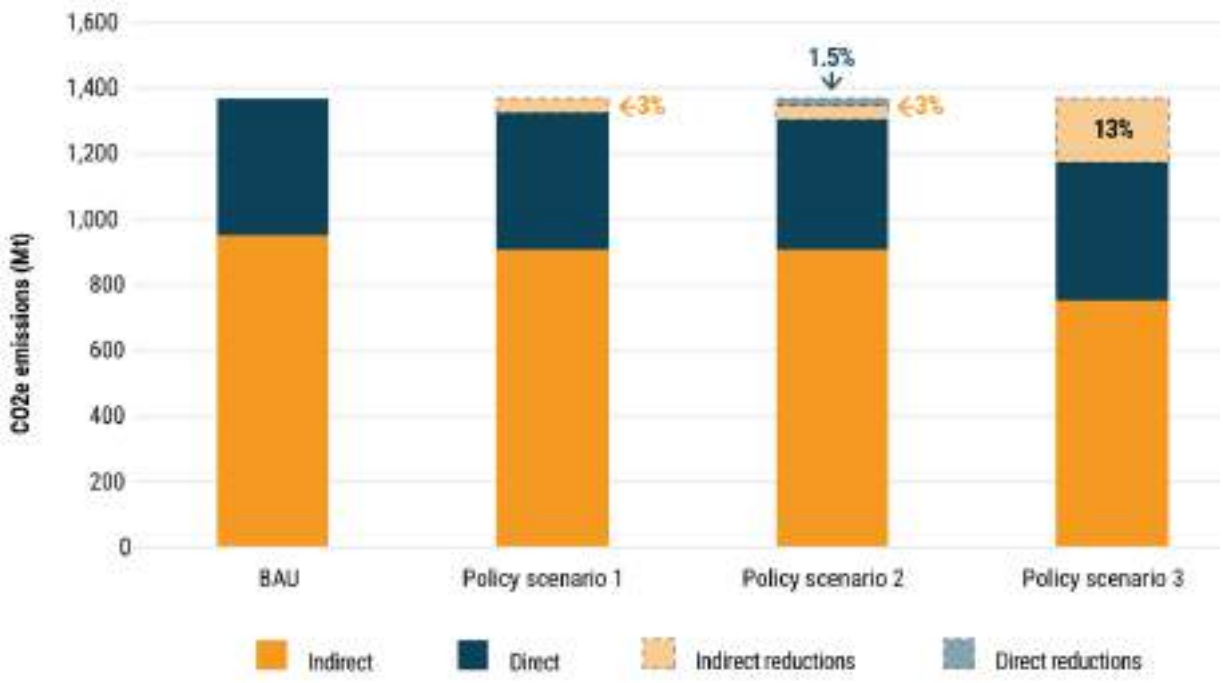
Figure 24: Annual combined direct and indirect emissions (MtCO2e) for the aggregated 11 countries, by policy scenario, 2026–2050



(Source: CLASP analysis)

Impacts vary by country, with some having much greater relative emissions reductions than others. In countries with relatively high market efficiency levels (e.g., Brazil), emissions reductions relative to BAU are lower, with fewer gains to be reaped from efficiency improvements. Countries with lower average efficiency levels often see much higher relative cumulative carbon emissions reductions.

Figure 25: Cumulative emissions and reductions (Mt CO2e) in 11 countries, 2026–2050, by emission type and scenario



(Source: CLASP analysis)

7.3 Lifecycle cost analysis

In this study, the calculated LCC for room ACs includes purchase price and operating costs.[73] The authors estimated the lifecycle costs for BAU, scenario 1, and scenario 3 (Figure 26).

Under scenario 1, the analysis showed that households in Barbados, Grenada, and Panama would see the largest LCC savings (estimated at 14%), followed by Jamaica (estimated at 10%). This can be attributed to these nations' long operational hours for room ACs and/or high electricity costs, meaning that even small improvements in efficiency can lead to significant reductions in cost. In most other focus countries, LCC savings under scenario 1 are estimated at 7% or less. Brazil saw no cost savings due to the high average efficiency of the existing market.

The LCC savings from scenario 1 could reach over $1,000 USD per consumer, although average LCC savings would be a more modest $100 USD or less.[74]

Under scenario 3, the largest LCC savings for households are in Barbados (46%); Grenada (44%); Panama (42%); Brazil and Jamaica (36%); Colombia (33%); and the Dominican Republic (27%). Chile, Uruguay, and Mexico have smaller savings at 19%, 14%, and 7% respectively, either because room ACs tend to be operated seasonally in these countries (as is the case in Chile and Uruguay) or because electricity prices are relatively low (as is true in Mexico). In Argentina, households experience cost increases under both scenarios because of the country's current economic situation, which combines high inflation and a high discount rate (95% for 2023).[75]

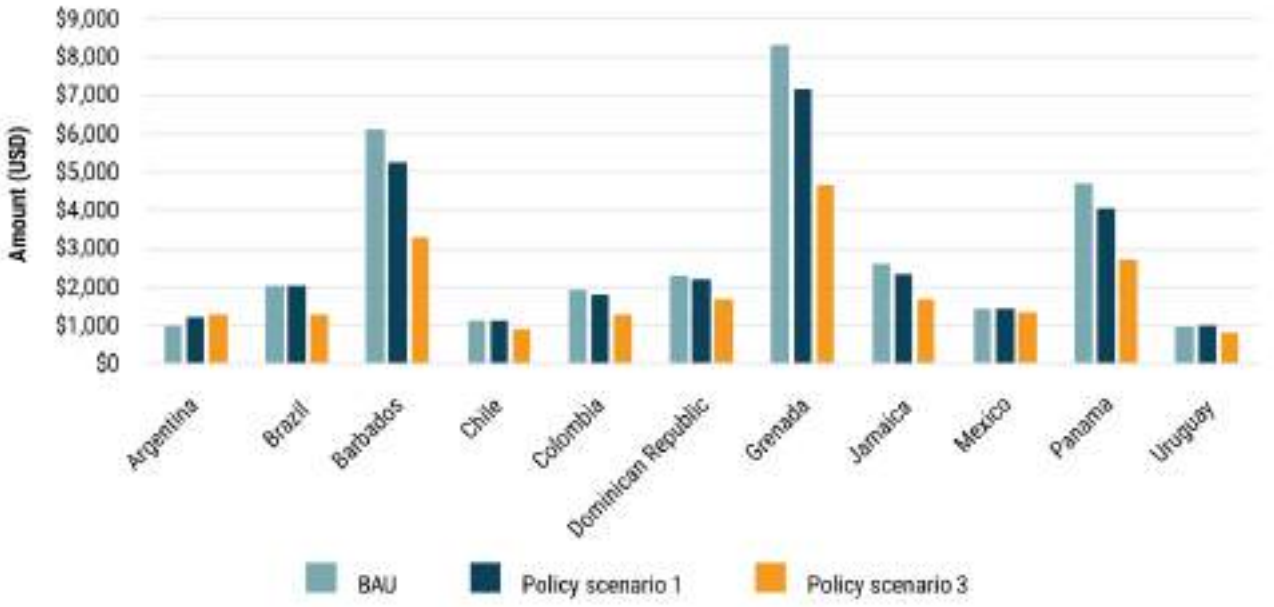
Under scenario 3, LCC savings increase significantly, reaching a maximum of $3,667 USD per consumer in Grenada, with most consumers saving $500 USD or more.

73 Representative units were selected for each country in the LCC analysis except for Barbados, Colombia, and Uruguay, because efficiency levels in CSPF or SEER were not widely available. The authors used Jamaica's representative unit data for Barbados and Chile's representative unit data for Uruguay and Colombia with the assumption that these markets are similar.

74 Except for Argentina where costs are higher due to significant inflation.

75 Discount rate is the rate of interest applied to future cash flows to determine their present value.

Figure 26: Lifecycle costs for 11 countries under business as usual, scenario 1, and scenario 3



Operating higher-efficiency units offers significant overall lifetime cost savings for consumers under the two efficiency policy scenarios. (Source: CLASP analysis)

Photo: Sergei Albaev/Sutterstock

08 Recommendations

Solutions to environmental dumping and obsolete refrigerants are a shared responsibility requiring close collaboration between importing- and exporting-country governments, the private sector, civil society, and international partners. The solutions must be coordinated, comprehensive, and improve access to energy-efficient, climate-friendly technologies across the world. Shared responsibility involving collaborations between importing and exporting countries is critical—especially given the institutional and resource constraints many climate-vulnerable low- and middle-income importing countries face.

Building on the findings of this report, the authors present a set of recommendations for policymakers and stakeholders in the LAC region. These actions are designed to curb environmental dumping and facilitate the equitable and timely transition to efficient, low-GWP room AC technologies.

By working in partnership with exporting countries, engaging the private sector, and leveraging action under and support from the Montreal Protocol, LAC countries can strengthen their markets, protect the climate and their people, and ensure access to leading technologies for their populations.

Policymakers in Latin America and the Caribbean

Implement ambitious policies and ensure compliance

Harmonize to UNEP U4E Model Regulation Guidelines by 2027 nationally and regionally

- Introduce ambitious MEPS to help block the influx of environmentally harmful equipment, curb environmental dumping, and contribute to GHG emissions reductions.
- In parallel, incorporate seasonal efficiency metrics, such as SEER or CSPF, to better reflect real-world room AC performance and recognize the growing consumer preference for inverter technologies, which offer significant energy savings.
- Align policies at the regional level to help streamline trade, reduce the influx of inefficient products, ensure a more consistent regulatory framework across countries, and reduce costs of compliance. Regional policy alignment will also simplify compliance for manufacturers and importers, enhance manufacturers' cross-border competitiveness, and strengthen enforcement mechanisms.

Brazil's MEPS and seasonal performance metric were introduced in 2020, transforming the market into the most efficient among the focus countries.

Review and revise MEPS and energy labeling thresholds every three to four years to keep pace with technological advancement.

- Revisit policies in a timely fashion. Failure to do so allows outdated, substandard room AC technologies to enter and remain in operation for up to a decade, locking in high energy consumption and emissions.

Require labels to be displayed in both retail and online shops. Conduct compliance measures such as market checks to ensure that labeling requirements and MEPS are followed.

- Display efficiency information on products to help consumers make informed decisions when purchasing room ACs.

Online room AC purchases are growing in the region. As a result, displaying correct efficiency information and energy labels for room ACs in online shops is key.

Adopt regulations or other initiatives in line with the Kigali Amendment to accelerate phasedown of high-GWP refrigerants in economies with room AC import markets.

- Align with frameworks such as the UNEP U4E Model Regulation Guidelines on refrigerant use in room ACs.
- Adopt policies that ban high-GWP refrigerants like R-410A, which still dominate several national markets in the region.

Grenada leads in the regional transition to an ultralow-GWP refrigerant, R-290, in room AC sector. It is also expected to pass a ban on using high-GWP refrigerants in the room AC sector, further advancing the transition.

Review local content requirements and other industrial policies periodically to ensure they balance innovation and competition with supply vulnerabilities and localization.

- Ensure that policies are kept updated to encourage a competitive manufacturing environment and support transfers of high-efficiency technology. While supporting local industry is important for economic development and job creation, overly protective policies can limit access to advanced, energy-efficient, and innovative technologies for manufacturing efficient, cost-competitive products.

Introduce World Trade Organization-compliant import policies and incentives to promote high-efficiency room ACs.

- Develop preferential import policies for efficient equipment, such as policies that require meeting standards consistent with exporting-country MEPS or global benchmarks, to help promote the adoption of such equipment and make it more competitive. This can include measures such as reduced import duties, lower value-added taxes, and subsidies.[cviii]

Increase demand for efficient technologies and facilitate access to cooling

Design incentive programs for manufacturers to produce more efficient room ACs.

- Create effective programs such as green government procurement efforts and buyer clubs,[cix] which demonstrate the benefits of transitioning to efficient room ACs and signal manufacturers to produce more efficient room ACs, as well as bulk purchases, which help aggregate demand for high-efficiency and low-GWP room ACs at affordable prices. The latter program type can be designed to target replacement of older and inefficient room AC equipment that contains high-GWP refrigerants.

The MLF has an Energy Efficiency operational framework with $100 million USD available to provide incentives to eligible manufacturers to produce more efficient equipment, including room ACs.[cx]

Develop and implement targeted incentive programs to enable low-income households to purchase energy-efficient room ACs.

- Prioritize affordability and long-term energy savings through various means including subsidies, rebates, and low-interest financing for high-efficiency, low-GWP models. Well-designed incentive schemes can help lower the initial cost barrier and accelerate market penetration of efficient cooling technologies, particularly for low-income households that face disproportionate financial barriers in purchasing efficient cooling technologies. These programs should be integrated with public awareness campaigns.

Colombia and Mexico have implemented programs targeting the replacement of room ACs with high-efficiency models in low-income households.

The MLF has a $20 million USD funding window for pilot projects to maintain or improve energy efficiency of cooling equipment while phasing down HFCs, including technology demonstration to end users to facilitate the adoption of more efficient room ACs with low-GWP refrigerants.[cxi]

Implement gender-focused policies

Develop, implement, and amplify programs to expand access to sustainable and affordable cooling solutions for women, who disproportionately face heat stress at home and in the workplace.

- Introduce inclusive cooling access programs, which may include subsidies or financing of energy-efficient cooling technologies for low-income households and women-led households.

Governments can also integrate cooling access into broader gender-responsive housing, health, and informal labor policies.

Expand training, certification, and employment of women in the heating, ventilation, and air conditioning (HVAC) sector.

- Governments, technical institutes, industry associations, and international development partners can collaborate to design inclusive vocational training programs that provide women with technical skills, mentorship, and job placement support. Despite the growing demand for skilled HVAC professionals and efforts regionally and under the MLF, women remain significantly underrepresented in this field today. Programs designed to change this can include scholarships, financial incentives, industry partnerships, and awareness campaigns to challenge stereotypes and promote HVAC careers among women.

Policymakers in countries exporting to Latin America and the Caribbean

Align exports with domestic market requirements.

- Ensure that exports meet the exporting country's domestic requirements, at a minimum, and remove loopholes or exemptions that allow export of those that do not.
- Promote other policy mechanisms, agreements, and cooperation with key stakeholders that will disincentivize the export of low-efficiency room ACs using high-GWP refrigerants. Such policies will benefit all import markets, not only the LAC region.

Private-sector stakeholders doing businesss in Latin America and the Caribbean

Commit to net zero by producing and selling efficient room ACs in all markets and providing transparent and publicly available strategies and actionable plans to meet net zero goals.

- Include strategies to bring efficient appliances to all consumers as part of all corporate net zero initiatives.
- Extend commitments to manufacture and promote efficient appliances equally to all markets globally.

Make energy efficiency and low-GWP refrigerants core components of global product strategy.

- Integrate efficient room AC technologies into the design and marketing of products across all income segments and geographies. These actions can include designing affordable high-efficiency models for low- and middle-income markets and offering financial solutions (e.g., trade-in offers and consumer financing plans) to increase access to high-efficiency and low-GWP room ACs.

Collaborate with governments and development partners to strengthen policy and market infrastructure.

- Take actions such as supporting technician training on properly installing and maintaining efficient room ACs with low-GWP refrigerants and participating in public awareness campaigns to inform consumers about the energy savings and lifecycle benefits of these appliances.

Stakeholders of the Montreal Protocol

Provide MLF funding for enterprises and countries to improve room AC energy efficiency alongside the transition to low-GWP refrigerants.

- Maintain energy efficiency enhancements as part of the HFC phasedown to benefit LAC manufacturers and local markets. The MLF has an energy efficiency operational framework with $100 million USD to provide incentives to eligible manufacturers to produce more efficient equipment, including room ACs. It also has a funding window for $20 million USD for pilot projects to maintain or improve energy efficiency while phasing down HFCs. The guidelines for the preparation of Kigali HFC implementation plans were approved in 2021. Currently, room AC energy efficiency enhancements, alongside conversion of production lines from HFCs to low-GWP alternatives, are proposed in pilot projects. MLF support for energy efficiency improvements to room AC manufacturers in Brazil and Argentina could help strengthen and maintain their competitiveness.

Support and advance measures to prevent environmental dumping of inefficient and high-GWP room ACs under the framework of the Montreal Protocol.

- Collaborate with policymakers, technical experts, and partner organizations to raise awareness of

these issues and build political momentum around them.

- Support solutions that involve importing and exporting parties (not only those relying on importing Article 5 Party funding), policy development, and enforcement.
- Develop coordinated strategies for introducing and supporting stop-dumping initiatives.

Preventing environmental dumping is a key step in ensuring markets are primed for access to next-generation cooling technology and other solutions in our warming world, which will deliver efficient, climate-friendly cooling access for households in the LAC region.

Photo: CLASP

Areas for further research

Research into the following topics relevant to environmental dumping, encompassing cooling access and room AC markets and trade, servicing, and end-of-life treatment, would complement this report:

- Second-hand room AC markets and opportunities to regulate them through adding provisions in energy efficiency policies, bans, and other import restrictions
- The opportunity for strengthened regulatory oversight in free trade zones to address environmental dumping of room ACs
- Market surveillance systems and efficiency regulation enforcement
- The room AC servicing sector
- Integrated cooling strategies such as passive cooling, district cooling, frugal innovation, and servicing business models
- The disposal of end-of-life cooling appliances and extended producer responsibility for room ACs
- Commercial air conditioning systems

Photo: PRADIP GHOSH/Shutterstock

Annexes

The following supplemental materials can be downloaded from the report landing page for additional details:

1. Detailed Methodology
2. Trade Zones, Trade Agreements and Tariffs
3. Energy Efficiency Policy Overview
4. Country Commitments to Sustainable Cooling
5. Brand Climate Commitments
6. Brands Selling Units with R-32 Refrigerant
7. Multilateral Fund for the Implementation of the Montreal Protocol Dispersion

Photo: Reynaldo G. Lopes/AdobeStock

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