

**ENERGY EFFICIENCY IN BUILDINGS**

# Cali, Colombia

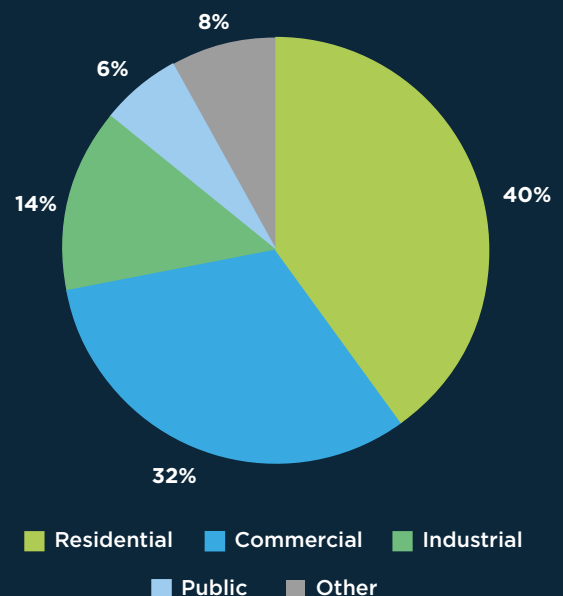
**STATUS AND TRENDS**

Situated in the South-West of Colombia, Santiago de Cali (Cali) is the capital of the Cauca Valley department. Cali has a tropical savannah climate and is one of Colombia’s most populous cities, with 2.1 million inhabitants over an area of 619 km<sup>2</sup>, making it the country’s largest city with the exit to the Pacific Ocean (DANE, 2018). The city has been growing driven by urbanisation, which has been prominent in Colombia in recent years.

Cali makes a notable contribution to the country’s economy, corresponding to 10% of national GDP (2016), partly due to its strategic position close to the border with Ecuador and the harbour of Buenaventura. The main economic sectors of the city are manufacturing, commercial and retail, as well as public services (Alcaldía de Santiago de Cali, 2015) (Cámara de Comercio de Cali, 2016).

While the electricity consumption in the residential sector has been stable over the years, with approximately 1100 GWh used per year, commercial and retail sectors showed a growth from 794 GWh in 2008 to 876 GWh in 2014. On the other hand, electricity consumption for public services decreased from 188 GWh in 2008 to 167 GWh in 2014. The residential building sector accounts for the largest share of energy consumption – 40 percent, followed by commercial buildings (32 percent). Adding public services into the equation means that almost 80 percent of the city’s energy consumption occurs in buildings (see Figure 1).

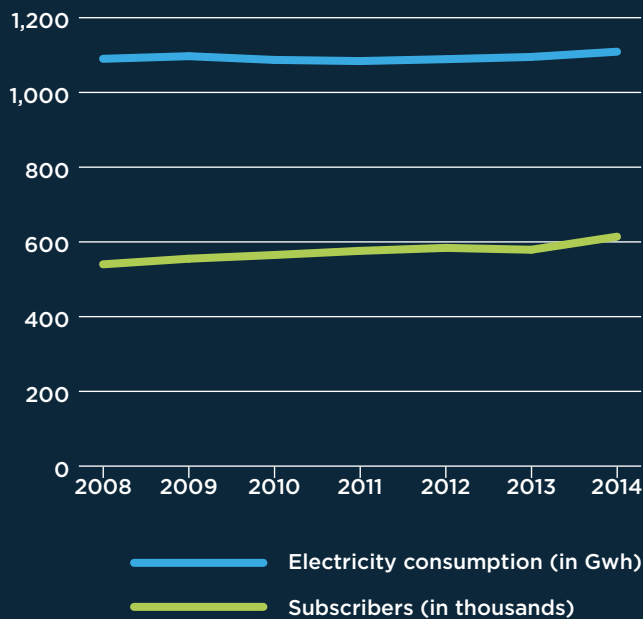
Figure 1. Energy consumption by sector in Cali in 2015.



Source: Departamento Administrativo de Planeación (2015).

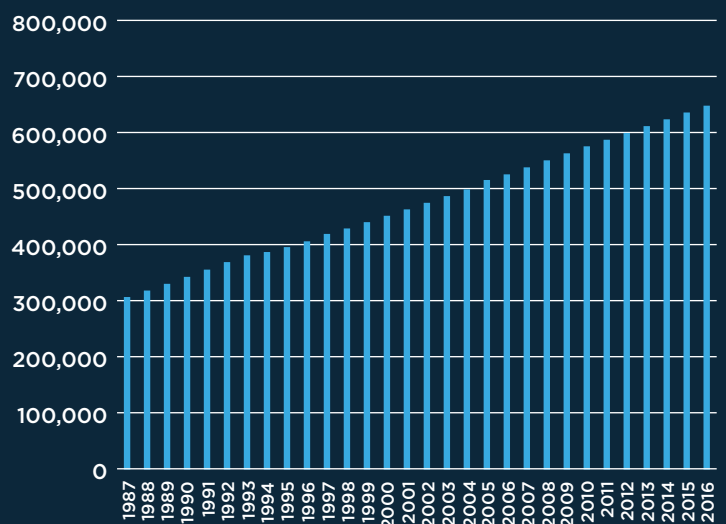
The number of electricity users in the residential sector has been continually increasing between 2006 and 2014, while electricity consumption has remained quite steady (Figure 2).

Figure 2. Electricity in the residential sector in Cali.



Source: Departamento Administrativo de Planeación (2015).

Figure 3. Total number of residential dwellings from 1987 to 2016



Source: Corporación Autónoma Regional del Valle del Cauca (CVC), Centro Internacional de Agricultura Tropical (CIAT), Departamento Administrativo de Gestión del Medio Ambiente (DAGMA) (2015).

The number of residential buildings in Cali has been continuously increasing over the past decades, amounting to 634,253 dwellings in 2015 (see Figure 3). In fact, across Colombian cities, Cali has the highest rate of construction of new buildings, which increased by approximately 2% between January and September 2017 in comparison to 2016 data (Cámara de Comercio de Cali, 2018).

Efforts are also being made to improve the state of existing buildings in the city – between 2007 and 2013, 7510 buildings received the official license for renovation. Yet, despite the increase in the total number of residential buildings, the newly-built floor area of residential building decreased over the last several years, with 912,246 m<sup>2</sup> of floor area constructed in 2007 versus only 421,983 m<sup>2</sup> – in 2013 (see Figure 3).

The floor area of newly built non-residential buildings have also decreased. In fact, the new floor area for commercial and retail buildings in 2007 was 254,508 m<sup>2</sup> while in 2013 only 164,223 m<sup>2</sup> of this type of the floor space was constructed (Departamento Administrativo de Planeación, 2015).

Currently the city has insufficient and quite outdated official data on energy access and energy supply to households, as the latest available figures are from the census of 2005 (Alcaldía de Santiago de Cali, 2018a). The national census for 2018, when published, will provide more exhaustive and recent data. A large amount of buildings in Cali do not have building licenses (approximately 60% according to 2015 statistics) and there is a significant share of buildings categorised as residential, but often used for commercial purposes (Redacción de El País, 2015) (Redacción de El País, 2018).

## INSTITUTIONAL FRAMEWORK

The local institutions related to the design, development and/or implementation of energy efficiency actions in Cali are the following:

- *Secretaría de Infraestructura* (Secretary of Infrastructure) – this institution develops infrastructure projects in Cali, as well as conducts research of socioeconomic factors for implementation and replication of projects (Alcaldía de Santiago de Cali, 2018b).
- *Secretaría de Movilidad* (Secretary of Mobility) – in relation to efficient transportation, the *Subsecretaría de Movilidad Sostenible y Seguridad Vial* (Sub secretary for sustainable mobility and street-safety) aims at implementing strategies for smart urban and rural mobility in Cali, as well as supporting the design of local policies for achieving sustainable goals (Alcaldía de Santiago de Cali, 2018c).
- *Departamento Administrativo de Gestión del Medio Ambiente* (DAGMA – Administrative Department for Environmental Management) – this institution has the highest authority for environmental matters in Cali. DAGMA coordinates with other stakeholders to align local actions with national commitments and policies, including the ones on energy efficiency. Aiming at sustainable development of the city, it also releases official plans and operational policies, which include energy efficiency aspects, such as the *Plan Integral de Adaptación y Mitigación al Cambio Climático para Santiago de Cali* (the Municipal Plan for Climate Change Mitigation and Adaptation for Santiago de Cali) (Alcaldía de Santiago de Cali, 2018d).
- *Secretaría de Desarrollo Económico* (Secretary of Economic Development) – this institution promotes economic savings and innovation. Hence, transversally,

improvements for fostering energy efficiency should align with their mandate (Alcaldía de Santiago de Cali, 2018e).

The energy supplier for Cali is the state-owned company Empresas Municipales de Cali (EMCALI), which also provides the city with water and telecommunications services. Until 2002 EMCALI was owned by the Municipality of Cali and it is currently state property, which delivers energy services to approximately 500,000 customers (Schneider Electric, 2015) (EMCALI, 2018). In 2018, EMCALI adopted a Strategic Plan until 2023, which, among other goals, aims at creating an environmentally sustainable model of operating and working in line with the sustainable development goals (SDGs). This model is intended to be replicated in other companies in Colombia (Cortés, 2018).

The institutions described above have diverse roles and functions in terms of energy efficiency; however, the city lacks authorities specifically designated to energy efficiency. At the national level there are currently the Ministry of Housing, City and Territory and the Ministry of Energy, which are dealing with various aspects of energy efficiency improvement; however the institutional portfolio of Cali lacks authorities with direct responsibility for energy efficiency in buildings. This limits creation of favourable institutional environment to implement national policies at the municipal level (Ministerio de Minas y Energía, 2016).

## POLICY FRAMEWORK

Cali must comply with the National Resolution 549 (2015), which implies that cities follow the guidelines for sustainable construction of new buildings dictated by the Resolution (Corporación Autónoma Regional del Valle del Cauca - CVC; Corporación Biocomercio Sostenible - DAGMA, 2017). The guidelines are specific to the type of climate and building typology, targeting measures for energy and water efficiency, as well as urban sustainability. With regards to energy efficiency, the Resolution includes both measures for passive energy conservation, e.g. window-to-wall ratio, as well as active measures, e.g. efficient heating, ventilation, and air conditioning (HVAC) technologies. Referring to Cali, due to its dry warm climate, the suggested energy efficiency measures include: installation of efficient lighting and appliances, usage of air conditioning devices with high coefficient of performance and application of insulating materials during buildings' construction.

Aiming at becoming a "SMART City", Cali has also designed a series of initiatives encompassing energy efficiency, such as the Ciudadela CaliDa project, whose first goal is to construct eco-efficient buildings in the city area Navarro (Cámara de Comercio de Cali, 2014). Further technical studies have estimated that fast and simple measures for improving energy efficiency, mostly in relation to lighting and household appliances, would reduce energy consumption in Cali by 10-20%

(Municipalidad de Santiago de Cali; Servicios Ambientales S.A. (SASA), 2016)

The city of Cali also participates in the project to measure the footprint of cities (*Proyecto Huella de Ciudades*), with the objective to make an ad hoc diagnosis for the design of local policies on climate change mitigation, including measures for improving building energy efficiency. Measures from this project have been included in the *Plan Integral de Mitigación y Adaptación al Cambio Climático para Santiago de Cali* (Municipal Plan for Climate Change Mitigation and Adaptation).

The Plan includes a number of actions and measures required to achieve its objectives (see Box 1). Particularly, the *Programa de sensibilización en construcción sostenible en Santiago de Cali* (Programme to sensitize sustainable construction in Cali) aims at reducing energy consumption by 45% in hotels, hospitals, office buildings, malls and households by 2040 (with several intermediate targets), using the energy intensity of 132,5 kWh/m<sup>2</sup> per year as the baseline for both residential and non-residential buildings. This programme is at an early stage of preparation and it will involve managerial responsibilities from various municipal institutions, specifically from the *Secretaría de infraestructura*, the *Departamento Administrativo de Planeación Municipal* (DAPM - Administrative Department for Municipal Planning) and DAGMA (Corporación Autónoma Regional del Valle del Cauca (CVC), Centro Internacional de Agricultura Tropical (CIAT), Departamento Administrativo de Gestión del Medio Ambiente (DAGMA), 2016).

In relation to improving energy efficiency of residential buildings, the Plan's mitigation actions include use of sustainable materials for buildings construction, installation of efficient light bulbs and trainings on building energy management (Corporación Autónoma Regional del Valle del Cauca (CVC), Centro Internacional de Agricultura Tropical (CIAT), Departamento Administrativo de Gestión del Medio Ambiente (DAGMA), 2016). Moreover, the Plan suggests that the Municipality should focus more efforts on development of energy efficiency projects in the residential sector, including establishment of an energy efficiency fund to provide financing for residential projects, and develop a

### Box 1. Municipal Plan for Climate Change Mitigation and Adaptation of Cali

The principal objective of the Municipal Plan for Climate Change Mitigation and Adaptation is to create the initial elements for planning and managing the adaptation and mitigation to climate change in the Municipality of Santiago de Cali, from an institutional perspective.

The specific objectives include:

- To produce information on adaptation and mitigation on climate change for the municipality of Cali and build upon the already existing analysis.
- To describe and analyse the climate conditions, which may cause disasters and risks for the population and the ecosystem.
- To analyse factors, which address the decision making process for planning and development of the territory, compatible with the climatic situation.

programme to replace existing domestic refrigerators with more efficient ones.

In 2015, the Municipality released the plan PLANeVITA 2015-2027, developed in partnership with the Colombian foundation GIP and UN Habitat. The plan focuses on the social and environmental sustainability of dwellings in Cali in line with the national and international standards. In terms of building efficiency, PLANeVITA specifically emphasises the need for energy efficient building retrofits in Cali, however without setting specific quantitative and timebound targets (Municipio de Cali, UN Environment, Gestión e Innovación en Proyectos (GIP), 2015).

The Municipality has also defined a Plan for Green Businesses stating that one of the priorities is to improve sustainability of the residential sector through measures that include, among others, energy efficiency (Corporación Autónoma Regional del Valle del Cauca – CVC; Corporación Biocomercio Sostenible – DAGMA, 2017). 36 local businesses have also joined the *Programa Certificación Carbono Neutro Organizacional* (Programme for Zero-Carbon Certification), which aims at engaging the private sector in low-carbon activities, focusing on the energy sector as the largest producer of CO<sub>2</sub> emissions (DAGMA, 2016).

## INTERNATIONAL SUPPORT

Recently Cali has begun to develop a number of international collaborations to improve its energy efficiency, particularly in the light of the ambition to become a “SMART City”. In fact, the Municipality of Cali, the Regional Foundation for the Integrated Development and EMCALI (the state-owned company providing services such as water and electricity) made an agreement with the International Finance Corporation (IFC) to enhance transition of the city towards becoming a SMART City and to promote energy and water savings. This alliance focuses on infrastructure, services, communication and healthcare sectors, as well as inclusion of modern materials and technologies to enhance energy efficiency of new buildings (Corporación Autónoma Regional del Valle del Cauca – CVC; Corporación Biocomercio Sostenible – DAGMA, 2017).

In 2014, under the agreement between the Mayor of the city, Rodrigo Guerrero Velasco, the Colombian ambassador in the US., Luis Carlos Villegas, and the head of EMCALI (the Colombian state-owned provider of electricity and water services for Cali), the Deputy Secretary for Energy of the US, Daniel Poneman, and the Ministry of Mining and Energy of Colombia, the first Solar Decathlon of Latin America and Caribbean was held in Cali, bringing together projects around designing efficient, innovative and accessible houses (Alcaldía de Santiago de Cali, 2014). In 2019, Cali will host the next Solar Decathlon Latin America and Caribbean, which will have a special focus on housing solutions tailored to the Latin America and Caribbean region. The proposed solutions are required to be affordable, accommodate occupants with reduced mobility,

be suitable for dense urban areas, and make efficient use of natural resources (U.S. department of energy, 2018).

Cali is one of the five cities in Colombia participating in the project *Distritos Térmicos en Colombia*, to improve the efficiency of energy supply for buildings by implementing district energy systems (DES). The project is supported by the Ministry of Environment and Sustainable Development, the Swiss Agency for Economic Cooperation (SECO), the Presidential Agency for International Cooperation of Colombia (APC) and the Public Enterprises of Medellín (EPM). The cities, including Cali, are currently identifying and assessing the districts for potential implementation of DES (Ministerio de Minas y Energía, 2016).

## LOCAL IMPLEMENTING CAPACITY

Progress on implementing the energy efficiency agenda in Cali is still quite limited, hence improving the local capacity to identify, design and undertake respective actions is a very important step for the city. There is a number of challenges that need to be addressed to improve local capacity in the area of policy design and implementation for the building sector, namely:

- Lack of recent data on energy consumption, building stock and construction developments in Cali;
- High percentage of informal buildings, which lack access to modern sustainable energy services and energy efficient solutions;
- Lack of awareness of energy efficiency opportunities, particularly in the building sector;
- Political priority given to other sectors (e.g. transport, street lighting) in terms of allocating resources for development of energy efficiency projects;
- Lack of a clear political mandate for designing and implementing energy efficiency improvements and respective agencies responsible for that;
- Weak coordination between the national and municipal levels of energy governance;
- Limited institutional power and lack of a clearly defined institutional mandates at the local level to design and develop energy efficiency actions, with most of the decision-making in this area taking place at the national level;
- Lack of good local practices and/or pilot projects to demonstrate benefits of improving energy efficiency in the building sector in Cali.

These challenges restrain the potential for development of energy efficiency actions, particularly in the building sector, limiting the city’s implementation capacity for energy efficiency improvements.

## RECOMMENDATIONS

- Develop an energy efficiency action plan for the city including models to translate identified actions into implementable projects;
- Set clear and timebound municipal level targets on energy efficiency improvement and make sure that the

- local energy efficiency agenda is in line with the national priorities;
- Establish an energy efficiency mandate within a designated competent agency to advance the local energy efficiency agenda and consolidate respective responsibilities in one place, instead of spreading them across limited functions of multiple institutions;
  - Require the established institutional body with the energy efficiency mandate to allocate resources to ensure implementation of energy efficiency projects, including: identifying local energy efficiency opportunities, developing project concepts and proposals, linking them to financing sources and securing funding with subsequent implementation of the measures in line with the Municipal Plan for Climate Change Mitigation and Adaptation, and national energy efficiency policies;
  - Develop local building standards for new construction and programs for energy efficient retrofit, which will incentivise the local market to transition towards higher level of building energy performance;
  - Include energy efficiency measures and requirements for achieving higher levels of building energy performance when licensing renovation and construction of buildings;
  - Establish a data collection framework at the city level to obtain and structure data on energy consumption in buildings. This process should be accompanied by installation of energy meters in buildings, which do not have them, in order to collect data on actual energy consumption. In large non-residential buildings a competent person should be made responsible for energy management of the building. That will require this person to undergo respective training;
  - Increase the local knowledge about energy efficiency, its opportunities and benefits by building local capacity and raising awareness. One of the starting points can be participation in city networks and initiatives such as the *Red colombiana de conocimiento en eficiencia energética* (The Colombian network of knowledge for energy efficiency) (RECIEE, 2018).

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