Inclusive and sustainable smart cities (CISI)

Towards the measurement of electromobility in international trade

An interactive online dashboard

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This document was prepared by Ira Nadine Ronzheimer, José Durán Lima and Matthew Gomies, staff of the Regional Integration Unit of the International Trade and Integration Division of the Economic Commission for Latin America and the Caribbean (ECLAC), and Cristóbal Budnevich, consultant with the same Division, as part of cluster 3 of the project "Inclusive and sustainable smart cities in the framework of the 2030 Agenda for Sustainable Development in Latin America and the Caribbean", implemented by ECLAC together with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and financed by the Federal Ministry of Economic Cooperation and Development (BMZ) of Germany. The project is part of the ECLAC-BMZ/GIZ cooperation programme.

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Contents

Objective and background

This document has been prepared in the context of the project "Inclusive, sustainable, and smart cities (CISI) within the framework of the 2030 Agenda for Sustainable Development in Latin America and the Caribbean", implemented by ECLAC with the support of GIZ. The main objectives of this collaboration are: i) to estimate the demand for electromobility in Latin American and the Caribbean (LAC) cities and facilitate its implementation; ii) to promote regional supply to meet the potential demand for electromobility; and iii) to promote a dialogue between stakeholders of sustainable urban mobility in cities and suppliers of buses and providers of inputs of the regional industry.

The focus of this methodology is set on electric buses as a sustainable alternative to conventional diesel buses. Among the advantages of electric buses are that they are less technically complex, more reliable, and safer than all other types of buses. Also, some of the main inputs for their production (iron ore, aluminum, copper, lithium, and graphite) can be found in large quantities in LAC. Moreover, 95% of them can be reused or recycled (Alcover, 2021). The main disadvantages of electric buses are the high initial costs and the need for investments in charging infrastructure, which is much less developed in the region than is the case for conventional buses. Additionally, there are indications that the production of electric batteries generates high CO_2 emissions (overall carbon emissions range of 59-119 kg CO_2-eq/kWh battery according to Emilsson and Dahllöf, (2019)). Another disadvantage is that the initial price of an electric bus is higher than that of a diesel-run bus. The electric battery technology is still maturing, and charging takes longer than refueling gas, diesel, and hydrogen. However, a well-planned infrastructure would likely ease this problem. Another point worth mentioning is the possibility of retrofitting, i.e., the conversion of conventional buses into electric buses by changing the necessary parts and installing an electric battery.

To estimate the productive capacity of the region in the context of electromobility, ECLAC's International Trade and Integration Division developed a methodology that identifies the required inputs of electric and conventional buses (benchmark) in the Harmonized System (HS) Product Code Trade Classification. Therefore, the parts and pieces and their corresponding HS codes have been identified and grouped to clusters (e.g., battery cluster, engine, etc.). In the second step, these elaborated products have been disaggregated, firstly, into their semi-elaborated input parts and, in the third step, based on the semi-elaborated parts, in their raw materials.

These three product-levels are referred to as vectors. Therefore, the methodology includes multiple dimensions (cluster- and vector-level) for the two types of buses. Furthermore, the HS product codes are assigned to large economic sectors, allowing the analysis of inputs also on the industry-level. In summary, based on the product codes identified, the trade flows can be analyzed on the product level, cluster level or industry level to estimate the productive capacity of the region and to identify the main global players in the context of electromobility. In addition, the required products have also been assigned weights and prices, making it possible to estimate the cost structures of electric buses.

The previously referred methodology has been visualized in different graphics in an online Dashboard.[1] The underlying document explains in more detail the goals, setup, and methodology of the Dashboard. As sustainability and climate change represent the context of the project, and to provide a more complete analysis, the Dashboard also contains visualizations of the temperature trend and emissions.

The Dashboard is a reproducible product that can be of use not only within the region, but globally as the inputs for the buses are highly similar around the world. It provides a useful tool not only for policy makers but also for entrepreneurs to assess business opportunities in their countries.

The Dashboard development includes two steps:

(i) The current Dashboard available contains visualizations from four main areas: a) temperature evolution, b) carbon emissions, c) production and operation of electric buses, and d) the decomposition of an electric bus including its price structure;

(ii) In the next step, the Dashboard shall link input requirements for electric buses with trade data from the UN Comtrade data base for interactive visualization (e.g., by selecting steel as input for bus bodies shows the top 10 global steel exporting and importing nations including maps, etc.).

It is important to mention that the Dashboard may be even further extended in multiple ways e.g., it could be linked with tariff data, it could include different battery types for visualizing comparisons, include other types of buses (natural gas, hydrogen), information on retrofitting etc., overall representings a very promising tool.

Two publications within the CISI project context are related to the development of the Dashboard: firstly, a methodological document that explains in detail the development of the bus product vector based on the HS and, secondly, a document that applies the developed methodology to characterize trade in electromobility. The underlying document represents a short methodological description on the development of the Dashboard itself. It can be understood as a subproduct of the document describing the development of the methodology on decomposing a bus into its components. The novelty of this document lies in the fact that it measures the nature of climate change, based on