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Methodology for the 2021 cycle of the International Comparison Programme for Latin America and the Caribbean

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The 2021 cycle of the International Comparison Programme (ICP) reflects the commitment of the Economic Commission for Latin America and the Caribbean (ECLAC) to strengthening the region's statistical systems and ensuring the Programme's continuity, in keeping with the guidelines of the International Comparison Programme Global Office of the World Bank.

Among the entities tasked with compiling economic data, ECLAC covers the third-highest number of countries and territories, although the region accounts for just 7.3% of global GDP. This was a significant challenge, all the more so given the consistent efforts required of national implementation agencies, especially in the Caribbean, to fulfil the objectives. The 32 economies (13 from Latin America and 19 from the Caribbean) in the 2021 cycle were: Anguilla, Antigua and Barbuda, Argentina, Aruba, Belize, Bermuda, Bonaire, Brazil, British Virgin Islands, Caiman Islands, Curaçao, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Honduras, Jamaica, Montserrat, Nicaragua, Panama, Paraguay, Peru, Plurinational State of Bolivia, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago and Uruguay.

Of the many challenges that marked this cycle, the most notable was the coronavirus disease (COVID-19) pandemic, which led to its postponement from 2020 to 2021 and delayed a series of activities. As data collection in the region began in 2019, price

data for some of the economies in the 2021 cycle reflected pre-pandemic cost structures. Multiple challenges emerged throughout the process, from data collection and processing to the publication of results. Each of these issues was nonetheless addressed, as ECLAC was committed to implementing and completing this cycle.

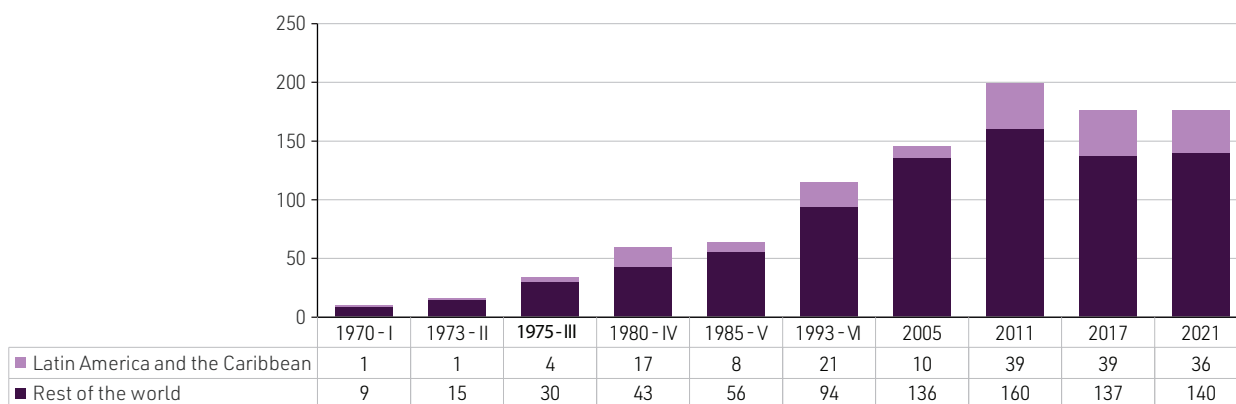
To understand the methodology of the International Comparison Programme, it is necessary to understand the process of calculating purchasing power parities (PPPs). This document aims to highlight the most important aspects of the process used to calculate the results of the 2021 cycle. It provides a methodical description of the steps required for calculating PPPs and the related indicators prepared by ECLAC for participating economies, in line with the international recommendations of the World Bank, which is recognized as a global authority on the matter.

1. Background

The first cycle of the International Comparison Programme was conducted in the late 1960s and early 1970s. Since then, it has steadily grown into the largest international statistical exercise in the world.

Angus Deaton (2013) described the International Comparison Programme as the “Olympic Games of prices”: it is not conducted annually; it started with only a few countries represented by high-performing competitors; and it has grown over time, with each cycle attracting more countries and professional statisticians than the last. Figure 1 illustrates how this statistical exercise has evolved.

» **Figure 1. Total number of economies participating in the International Comparison Programme, by cycle**



■ Latin America and the Caribbean ■ Rest of the world

Source: World Bank.

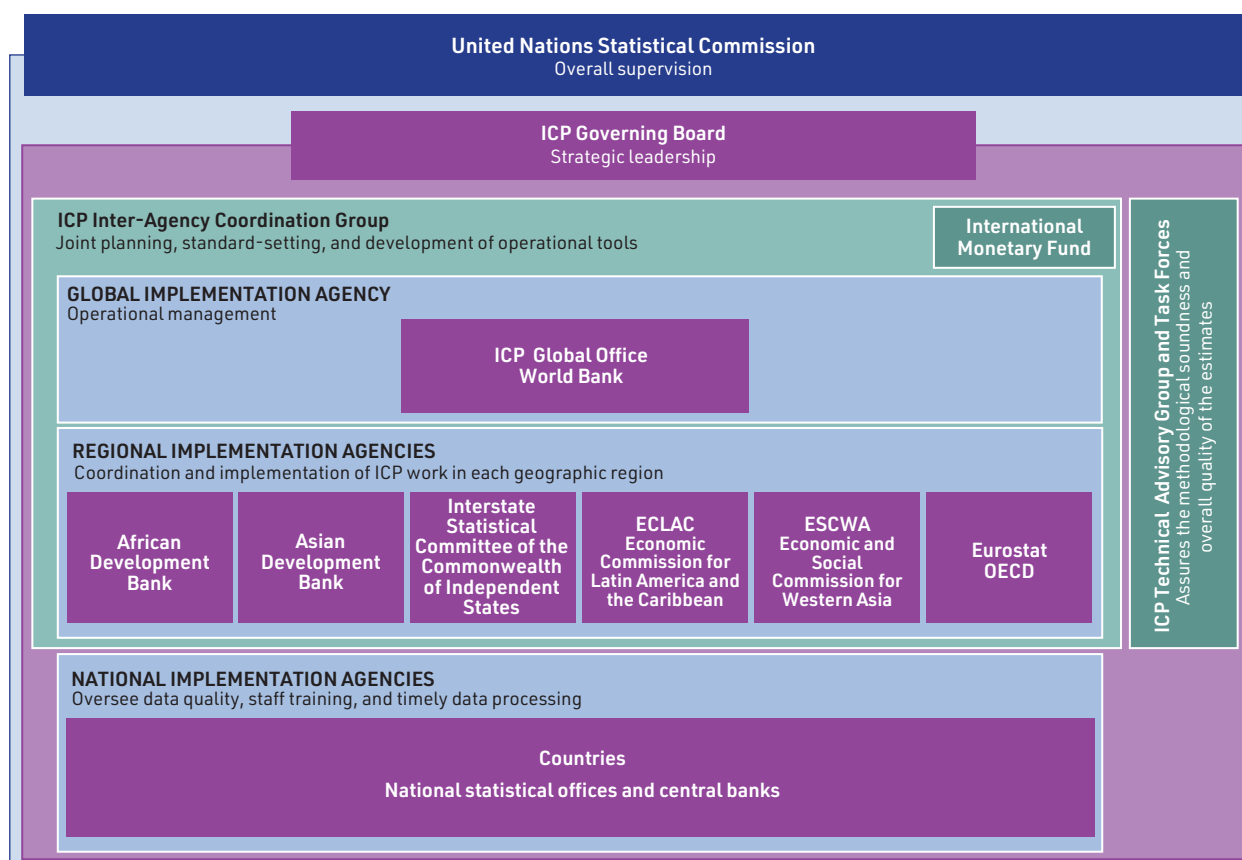
The 2005 cycle marked a milestone: it was the most international cycle yet, with a total of 146 economies participating, and attracted the highest number of professionals. It was also the first to be organized by the International Comparison Programme Global Office of the World Bank. Starting in 2011, efforts were made to conduct the Programme at more frequent intervals, and at the forty-seventh session of the Statistical Commission of the United Nations, held in March 2016, it was instituted as a permanent element of the global statistical programme.

The 2021 cycle was the Programme's tenth, with 176 economies participating. Of the 36 economies in Latin America and the Caribbean, 32 participated under ECLAC in its capacity as a regional implementation body, while Chile, Colombia, Costa Rica and Mexico participated under the Organisation for Economic Co-operation and Development (OECD).

2. Governance

The International Comparison Programme is managed by the World Bank under the auspices of the Statistical Commission of the United Nations. The Programme is implemented through cooperation among international, regional, subregional and national entities, using an established statistical methodology. Its governance framework is shown in diagram 1.

» Diagram 1. Structure and governance of the International Comparison Programme



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

National implementation agencies, whether statistical offices or central banks, report the prices and expenditure shares of their economies to regional implementation agencies. In Latin America and the Caribbean, ECLAC acts as the regional implementing agency, compiling and processing data from all national implementation agencies under its purview. ECLAC then submits its report to the World Bank, which consolidates the submissions from ECLAC and all other regional implementing agencies.

3. Uses of purchasing power parities

PPPs are a valuable source of information for many international organizations, policymakers, academics and the private sector. They are used for a variety of economic and social purposes, some examples of which are set out below.

- » By establishing a common currency, PPPs enable direct spatial comparisons, used for calculating expenditures. Also, as they are expressed in per capita terms, PPPs can be used to measure economic well-being and to compare the main components of GDP, such as actual individual consumption by households, actual final consumption by government, gross fixed capital formation and special classifications of consumption, such as food, education, health, housing and energy.
- » PPPs are used to measure many of the Sustainable Development Goal indicators including for Goals 1, 2, 4, 7, 8, 9 and 11 (World Bank, 2022). In addition to enabling the measurement of GDP and its components in real terms, PPPs are also the main indicator for estimating international poverty lines. Indeed, the World Bank recently updated the poverty line on the basis of the 2017 results (World Bank, 2024).
- » By classifying economies by price level and volume over a set period, PPPs enable countries to access loans and cooperation programmes from development banks and international organizations. For example, the International Monetary Fund¹ uses PPPs to determine member country quotas and borrowing limits.
- » PPPs can also be used to compare productivity.

Importantly, although PPPs have many applications, they should be used with care, in particular under the following circumstances:

- » In calculating growth rates, since PPP is a spatial rather than a temporal indicator.
- » As an indicator of the undervaluation or overvaluation of currency or in determining the equilibrium exchange rate.
- » In comparing production and productivity by industry, since PPPs provide expenditure aggregates.

4. Methodology for the calculation of regional purchasing power parities

The step-by-step process is described below, from inputs to calculation.

First, prices are reported for a basket of goods and services based on the detailed structure of nominal expenditure (basic heading level) for the GDP aggregations for each economy in line with international standards, using the System of National Accounts (SNA), the Classification of Individual Consumption According to Purpose, the Classification of the Functions of Government and the Classification of Products by Activity. These inputs are reported in the local currency.

As the aim is to compare prices across countries, consistency was ensured in terms of quantity and quality, with each price reported according to product specification, reference unit and size. The participating economies and ECLAC agreed on a regional basket containing 823 products aimed at ensuring availability in each category,

¹ See International Monetary Fund (IMF), "What are IMF quotas?" [online] <https://www.imf.org/es/About/Factsheets/Sheets/2022/IMF-Quotas>.

based on the global list of 949 products selected by the International Comparison Programme Global Office according to the criteria of representativity and comparability. The selected products were compared across economies to ensure that they represented an important share of final expenditure in each. The composition of the regional basket is presented in table 1.

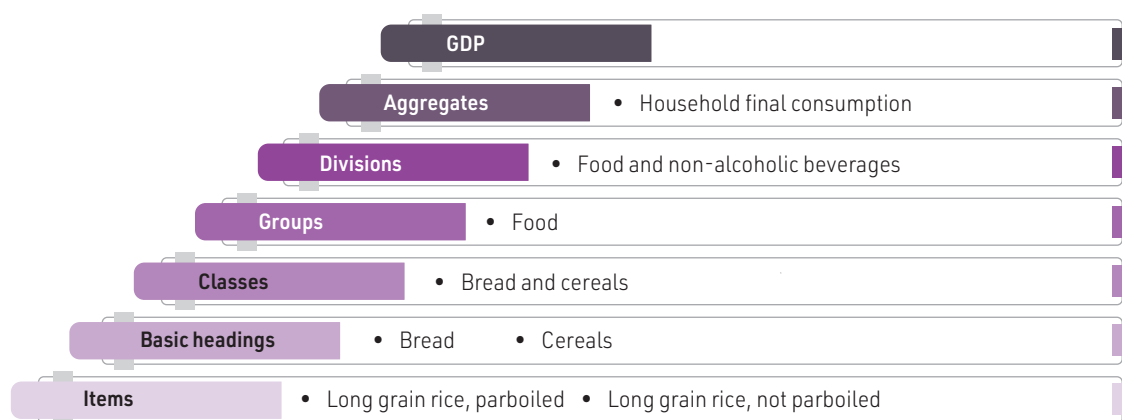
» **Table 1. Total products by expenditure category**

Questionnaire	Number of products	Share of total
Household final consumption	510	62.0
Private education	7	0.9
Housing rentals	19	2.3
Compensation of employees (government)	34	4.1
Construction	51	6.2
Machinery and equipment	202	24.5
Total products	823	100

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

This list structure is organized as follows: items are grouped under basic headings, which are grouped under classes, which are organized into groups. Groups, in turn, are organized into divisions, which comprise the main aggregates, or components of GDP (see diagram 2).

» **Diagram 2. GDP classification structure used to calculate purchasing power parities**



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

This information was used to perform a regional calculation; preliminary results for the 2021 cycle refer to the 32 economies of Latin America and the Caribbean previously mentioned.

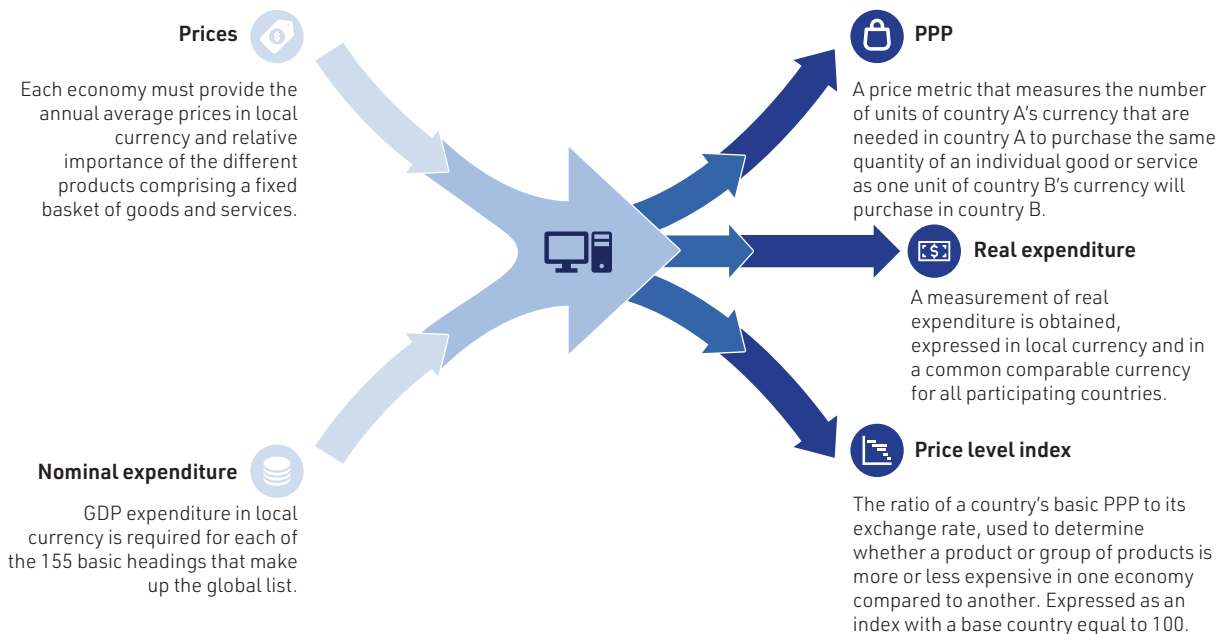
Annual average prices of each item, expressed in local currency and including taxes and other costs, were used to calculate the purchaser's price. In most instances, however, prices were collected on a quarterly basis, and sometimes outside the reference period. This made it necessary to use the highest-detail consumer price index available to align International Comparison Programme items with consumer price index items and apply a quarterly adjustment factor, making it possible to estimate an annual average for the calendar year. The relative importance of these products within the consumption pattern of each economy was also considered.

The World Bank's Model Report on Expenditure Statistics was used to compile nominal GDP by purpose of expenditure for each country, ensuring consistency from the basic heading level to the GDP level. Data were gathered through three methods: direct estimation (17 countries), borrowing of structure from similar economies (8 countries) and technical assistance from an expert consultant (7 Caribbean countries).

In the process for calculating PPPs illustrated in diagram 3, statistical models are applied to price and expenditure data to obtain three main products:

- » Purchasing power parities (PPPs)
- » Real expenditure, which provides a more accurate estimate of the real size of economies, as it does not use exchange rates as a conversion factor.
- » Price level index.

» Diagram 3. Process for calculating purchasing power parities



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

Owing to the volume of data processed, considerable effort was required to validate all the questionnaires on household final consumption, private education, housing rentals, government compensation of employees, construction, and machinery and equipment. Quaranta tables and Dikhanov tables, the two main tools used in that regard, identified problems such as erroneous units of measure, price estimates that did not meet required specifications, and transcription or data entry errors in the prices reported.

After reviewing the prices for each economy, the next step was to calculate PPPs at the basic heading level. This was done using a multiple linear regression model known as the Country Product Dummy method, proposed by Summers (1973), which meets the desired methodological criteria for this task because it ensures the properties of both transitivity and base country invariance in the resulting PPPs. The matrix of basic heading PPPs is calculated as follows:

$$y_{ij} = x_{ij}\beta + v_{ij}$$

where:

y_{ij} : average prices for product j in country i

x_{ij} : dummy variables for product j and country i

β : coefficient vector

v_{ij} : random error

This model describes the dependency of average prices expressed in Napierian logarithms with independent dummy variables, which are assigned a value of 0 or 1, with 0 indicating that no price was reported and 1 indicating that a price was reported. The main element in the model is the coefficient vector (β), as it represents the PPPs. In addition to this model, another variable —importance— was included in the equation. Each economy is evaluated on the basis of expert opinion to establish which products account for the largest share of expenditure within their respective groups, by assigning a value of 3 or 1 to the importance variable, where 3 indicates importance and 1 indicates unimportance. This variable enabled simple weighting of products deemed important to estimate basic heading PPPs, using Diewert's Weighted Country Product Dummy multiple linear regression model (Diewert, 2004). The importance variable was only applied to household final consumption products; for the remaining questionnaires, it was simply omitted.

Once the basic heading PPPs had been obtained, the matrix was refined, through two stages of the iterative Country Product Dummy method. This time, the method was aligned with the PPP matrix data calculated in the previous step, to produce more sound estimates for missing basic headings.

In cases where a price could not be obtained, either because no price was available or because obtaining it was onerous, reference PPPs were used, with the PPP matrix already imputed and the local currency expenditure matrix serving as inputs. Examples of basic headings for which reference PPPs are used include narcotics, imputed rental payments for housing, games of chance, prostitution and net export balances.

The basic headings under compensation of employees in the areas of health, education and collective consumption expenditures incurred by government were also adjusted, using the Penn World Table version 10.0, which contains data on employment, capital stock and employee compensation as a share of GDP for each economy. This information was used to calculate a productivity factor. A productivity adjustment was then applied to those basic heading PPPs, by dividing the relevant basic heading PPPs by the productivity factor for each economy.

In this case, a complete matrix of basic heading PPPs was obtained (estimated and reference PPPs). This is a key input for the aggregation of classes, groups, divisions and aggregates, all the way up to GDP, with the weighted expenditure matrix also serving as an input. PPPs were aggregated from the basic heading level to the GDP level using the Gini-Éltető-Köves-Szulc method.

The principle of fixity was then applied, according to which the volume relativity (real expenditure ratio) between any two countries from a region must remain unchanged when other countries or regions are added to the comparison. This requires calculating the linking factor, or the vector that links each grouping, from basic heading to GDP. The linking factor was calculated as follows:

- » Real expenditure was calculated for each subregion by dividing nominal expenditure by PPPs, using the PPPs estimated for the region's 32 economies.
- » Real expenditure was calculated a second time for each subregion, this time using the PPPs estimated for the group's 13 Latin American economies and those estimated for its 19 Caribbean economies.
- » The Caribbean expenditure vector calculated in step (ii) was divided by the Caribbean expenditure vector calculated in step (i) and the result was divided by the Latin American expenditure vector calculated in step (ii), yielding a quotient that was then multiplied by the Latin American expenditure vector calculated in step (i).
- » The above steps produced the linking factor, which was used to adjust the PPPs of the Caribbean economies, while the Latin American PPPs remained unchanged.

Next, the PPPs were used to deflate nominal GDP and its components to obtain real GDP and its derivative indicators in the common currency selected for the 2021 cycle. Because Brazil was selected as the base country for the cycle, the Brazilian real was selected as the common currency, along with the United States dollar.

The main indicators derived include:

- » Price level index, obtained by dividing each participating economy's PPP by its exchange rate and multiplying by 100.
- » Real expenditure, obtained by dividing nominal expenditure in local currency by PPP.
- » Real per capita expenditure, obtained by dividing an economy's real expenditure by its population.
- » Per capita expenditure indices, obtained by dividing each economy's real per capita expenditure by global real per capita expenditure and multiplying by 100.
- » Nominal and real expenditure shares of regional aggregates.

Expenditure statistics were compiled in line with the standards of the System of National Accounts, 2008 (European Commission and others, 2016). Some of the hierarchical and non-hierarchical basic headings of the 155 basic headings into which GDP is broken down are set out below.

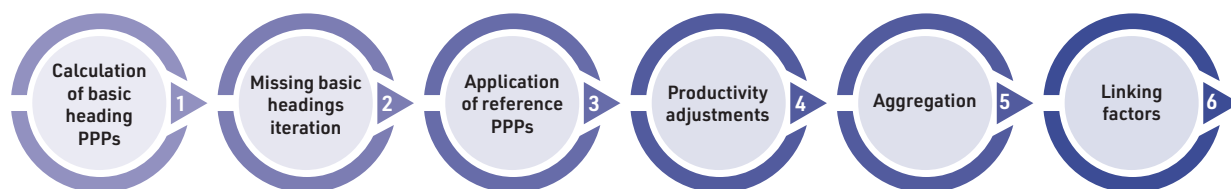
- » 1000000: Gross domestic product
- » 1300000: Individual consumption expenditure by government
- » 1400000: Collective consumption expenditure by government
- » 1500000: Gross capital formation
- » 9020000: Actual individual consumption
- » 9060000: Actual housing, water, electricity, gas and other fuels
- » 9080000: Actual health
- » 9100000: Final consumption expenditure by households and non-profit institutions serving households
- » 9120000: Actual education
- » 9270000: Final consumption expenditure by general government

Lastly, the following resources were used in the collection, validation (intracountry and intercountry) and aggregation phases:

- » Excel questionnaires provided by the World Bank for collecting data from special surveys and Model Reports on Expenditure Statistics circulated via email.
- » An Excel application using the April 2023 version of Visual Basic for Applications to collect quarterly household final consumption prices and perform intracountry validation.
- » The 2024 version of the International Comparison Programme System Excel application for validating quarterly and annual intercountry prices, and the aggregations (from basic heading to GDP).
- » The Model Reports on Expenditure Statistics validation form (in Excel), provided by the World Bank.

Diagram 4 illustrates the process used to calculate PPPs.

» Diagram 4. Step-by-step process for calculating purchasing power parities



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

5. Conclusions

Determining the real size of economies on an ongoing basis will strengthen the foundations of the International Comparison Programme in the region and bridge gaps in research that informs decision-making on public policy matters. Supporting the International Comparison Programme will improve and enrich the capacity of national statistical systems to produce indicators.

The objectives of the 2021 cycle of the International Comparison Programme were met despite the unexpected challenges that the pandemic presented in 2020, thanks to the use of modern technological tools. The meetings held (mostly in virtual format), the emails exchanged and the engagement exhibited by national statistical office focal points and the technical staff of the World Bank and the Economic Statistics Unit of ECLAC all attest to the level of dedication and commitment that characterized every step of the process.

Caribbean participation was key and especially remarkable given that the cycle coincided with other statistical undertakings in some of the countries. Latin America's contribution was also of considerable importance, given its economic weight in the region.

The results of the cycle are invaluable for measuring the real size, components of expenditure and price levels of the region's economies. Conducting these comparisons on a regular basis provides the Programme with the formality and rigour that it requires and will pave the way for stronger economic and social statistics.

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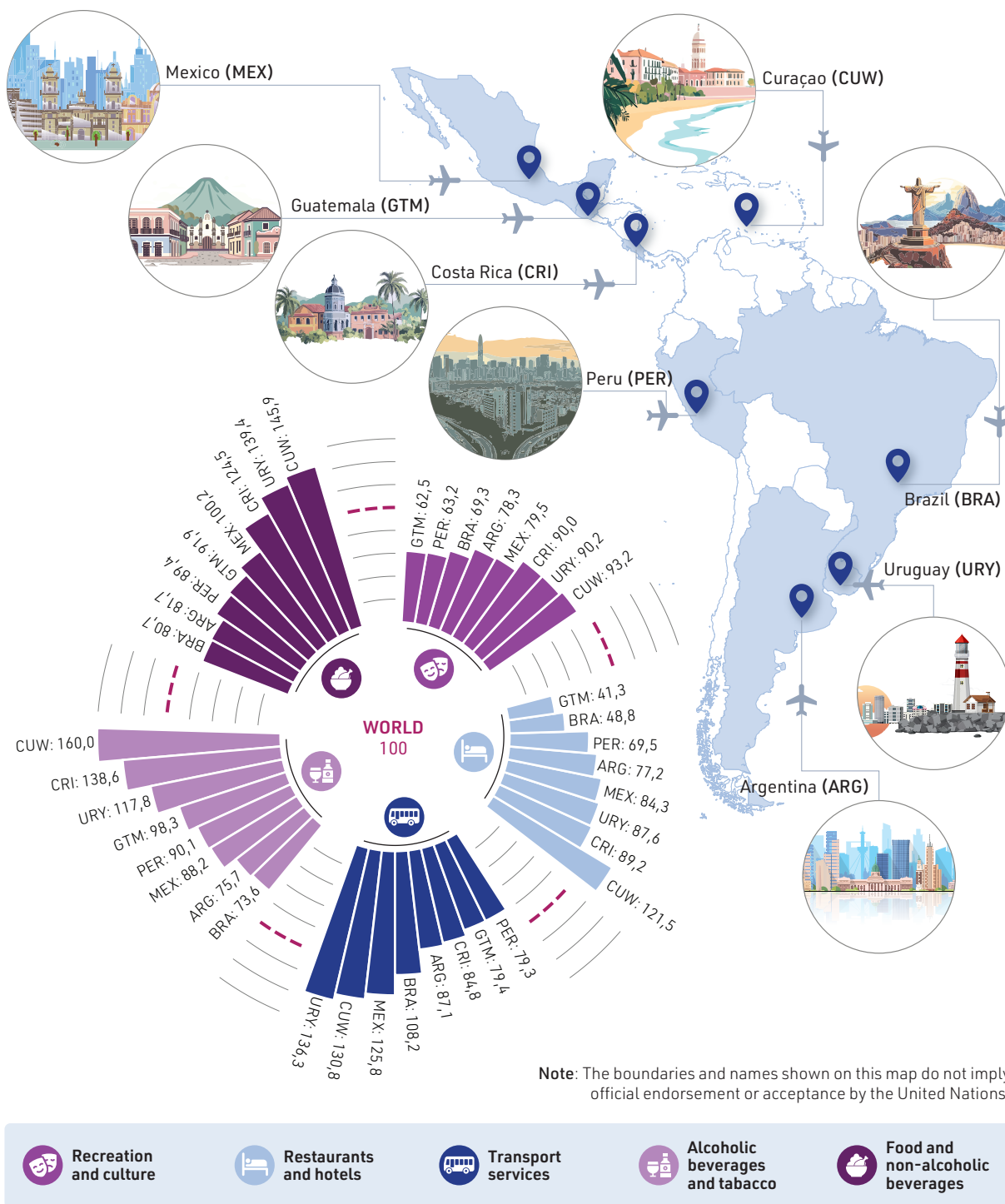
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Annex A1: Price level index, 2021

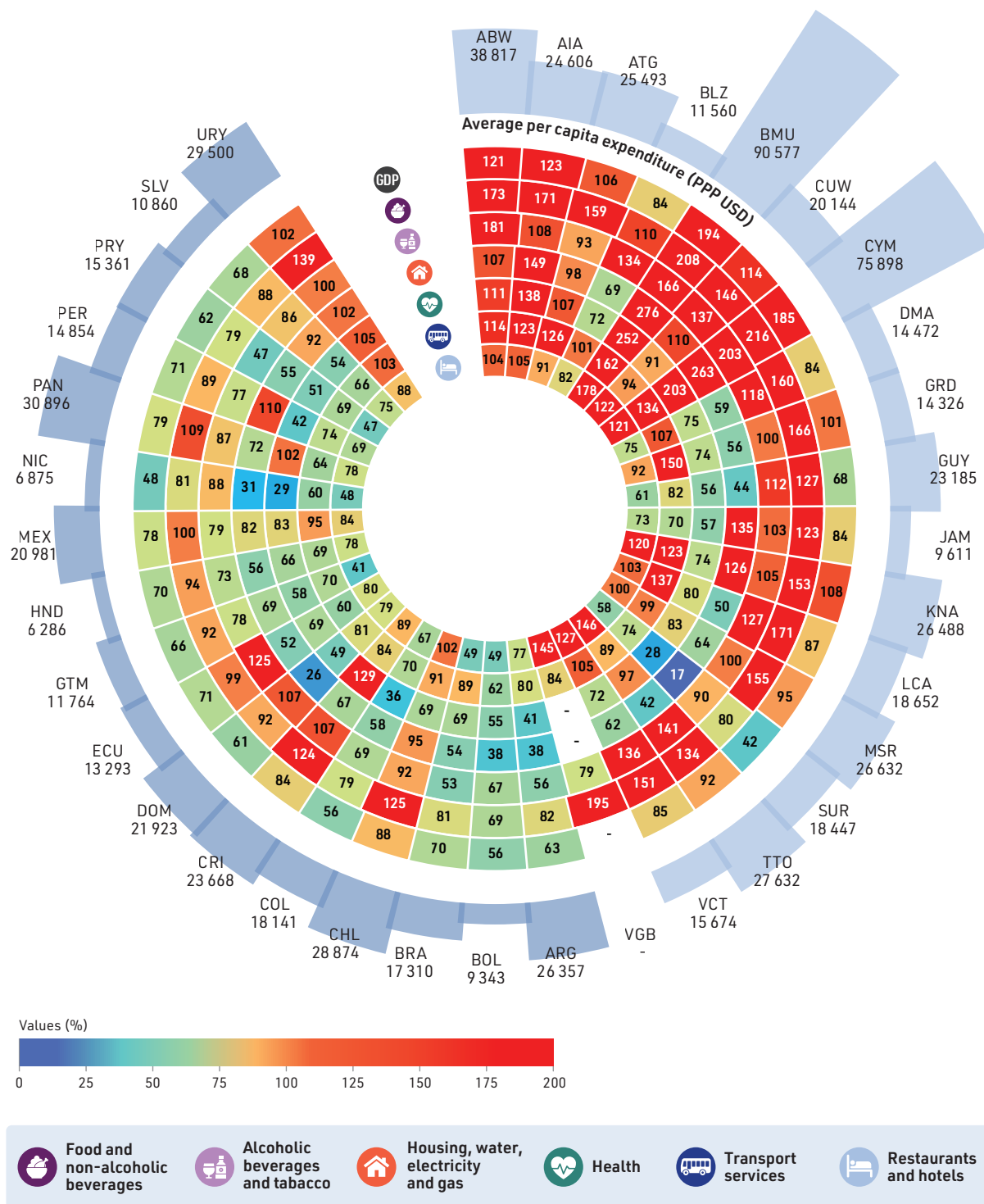
Choose your next travel destination by comparing the cost of living of the region's economies with the global average



Source: Economic Commission for Latin America and the Caribbean (ECLAC).

Annex A2: Price level index and per capita expenditure, 2021

Compare the regional price level index with average per capita expenditure in GDP terms



Source: Economic Commission for Latin America and the Caribbean (ECLAC).



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