

# ENERGY TRANSFORMATION

# LATIN AMERICA AND THE CARIBBEAN

Regional analysis extends from the Caribbean Islands and Central America to the southernmost tip of South America.

## STATUS/CHARACTERISTICS AND NEEDS:

### Population (millions)



**Current:** **6.1% of global population.**  
Highest regional share in Brazil (40%) followed by Colombia (10%) and Argentina (9%).

**2050 outlook:** Average **0.4% per year increase** to **536 million**, or 5.7% of global population.

IRENA analysis based on E3ME.

### GDP per capita (thousand USD 2015)

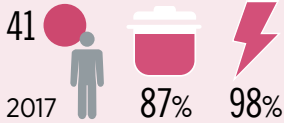


**Current:** **Below the global average (10.9).**

**2050 outlook:** **Swift development;**  
▶ **PES: CAGR = 3.8%**

IRENA analysis based on E3ME.



**Energy consumption** (GJ/capita) and **energy access** (%)**Energy consumption per capita:**

**Current: below global average** (51 GJ/year).

**Electricity access:**

Almost complete except for few countries such as Honduras and Haiti.

**Clean cooking access:**

13% of region's population lack access; major concern in some countries.

Source: Access to electricity, 2017 values (World Bank Group, 2019a), access to clean cooking, 2016 values (World Bank Group, 2019b), TFEC, 2017 values (IEA, 2019).

**Fossil fuel net import****Current status:**

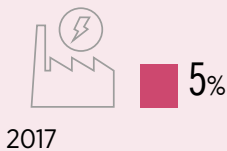
**Comparatively energy self-sufficiency region-wide;** Central America imports fossil fuels, while Andean and Southern Cone sub-regions are net exporters.

**2050 outlook:**

**Resource diversification; enormous untapped potential.**

► **PES:** The total generation (est. 3138 TWh) just represents **6%** of overall renewable power potential.

Note: Current status, IRENA analysis based on proportion of net imports of fossil fuels in TPES, 2017 values (IEA, 2019). 2050 outlook, IRENA analysis and potential based on Deng *et al.* (2015).

**Energy-intensive industries** (% in global consumption)**Current status:**

Accounts for **17%** of the world's energy demand for **food and tobacco** and **over 10%** of global energy consumption in the **paper industry**.

**2050 outlook:**

Require significant **efforts and specific solutions to decarbonise** energy-intensive industries.

Note: Current status, IRENA analysis based on 2017 values (IEA, 2019).

**Energy-related CO<sub>2</sub> emissions per capita** (tCO<sub>2</sub>/capita)**Recent:**

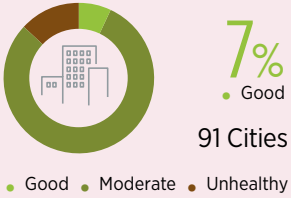
**Region's annual emissions: 1.2 Gt** (2018). 4% of global energy-related CO<sub>2</sub> emissions.

**2050 outlook:**

► **PES: 39% increase to 1.7 Gt** with enabling policies.

Note: 2050 values based on IRENA analysis and historical data based on Global Carbon Atlas (2019).

**Urban air quality (%)**



**Rising transport emissions** with continued population growth and urbanisation.

**Current plans would boost light-vehicle sales, but also intensify traffic jams and local pollution.**

IRENA analysis based on PM 2.5 concentration, 2016 and 2017 values (WHO, 2019).

**Electricity prices and renewables costs**

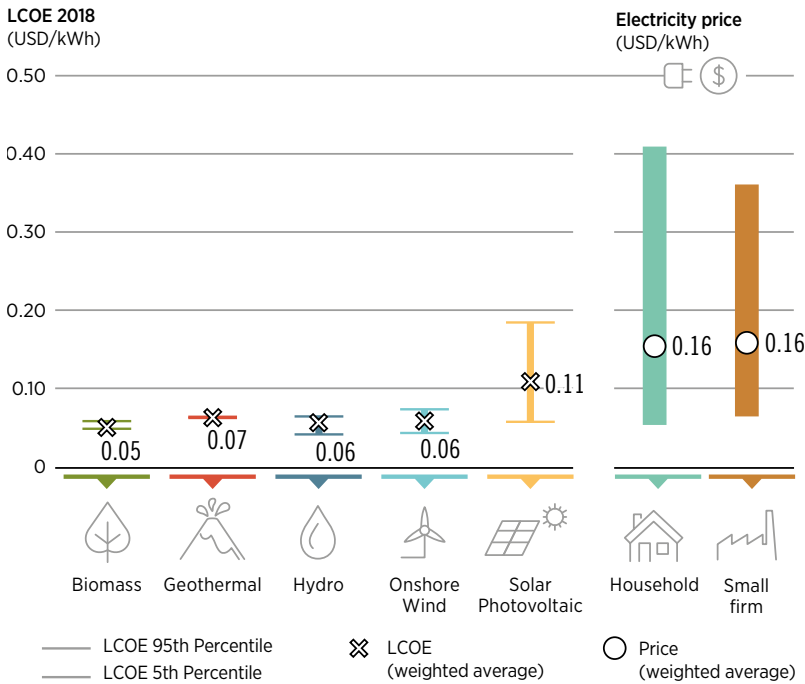
**Electricity price:**

**Mid-range** (for households and industries) compared to other regions.

**Renewables cost and auctions:**

Cost-competitive; Argentina attained wind price at an average of USD 0.041/kWh in 2017; Brazil attained solar price at an average of USD 0.021/kWh in 2019 (IRENA, 2019a). Hydropower projects remain highly competitive.

**Latin America and the Caribbean**



Source: LCOE based on IRENA (2019b) and electricity prices based on Global Petrol Prices (2019). Note: The LCOE data is for projects commissioned in 2018. Real weighted average cost of capital (WACC) is 7.5% for OECD countries and China and 10% for the rest of the world.

## ENERGY TRANSFORMATION: KEY BENEFITS

1

### AFFORDABLE, ACCESSIBLE ENERGY

- ▶ Lower system costs
- ▶ Distributed power for isolated communities
- ▶ Clean cooking



2

### ENERGY SECURITY, CLIMATE-RESILIENCE

- ▶ Resilience to climate, other risks
- ▶ Diversified energy supply
- ▶ Reduced energy demand with improved efficiency measures
- ▶ Improved infrastructure



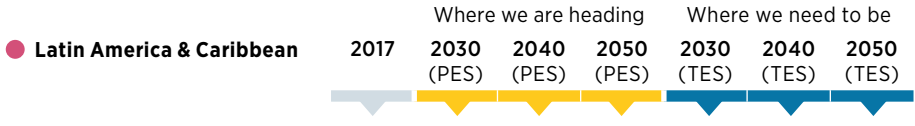
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### CLEAN, CLIMATE-SAFE ECONOMIES

- ▶ Economic development
- ▶ Trade gains by moving away from fossil fuels
- ▶ Better air quality and reduced local pollution
- ▶ Improved education and empowered citizens



## ENERGY TRANSFORMATION ROADMAP TO 2050



Energy (EJ)	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Supply (TPES)	27	35	42	46	30	32	33
Consumption (TFEC)	21	27	31	34	22	22	21

Renewables shares (modern)	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Supply (TPES)	30%	40%	42%	46%	53%	63%	73%
Consumption (TFEC)	30%	36%	37%	40%	47%	57%	67%
Power generation	65%	73%	75%	79%	85%	90%	93%



Electricity share in final energy consumption	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
End-use consumption	18%	22%	24%	26%	26%	31%	39%
Industry	21%	24%	24%	25%	27%	29%	33%
Transport	0.2%	1%	1%	2%	9%	14%	24%
Buildings	45%	58%	63%	67%	61%	70%	78%

Renewable installed capacity (GW)	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Bioenergy	19	45	61	79	50	72	94
Hydropower	173	181	201	226	186	211	240
Solar PV	5	76	128	177	108	196	281
Wind	17	74	111	148	93	141	188



Biofuels	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Liquid biofuels (billions of litres per year)	31	61	74	79	61	75	73



CO <sub>2</sub> emissions (energy-related)	2017	2030 (PES)	2040 (PES)	2050 (PES)	2030 (TES)	2040 (TES)	2050 (TES)
Annual level (Gt CO <sub>2</sub> /yr)	1.2	1.4	1.6	1.7	1	0.8	0.6
Reduction vs. today	NA	19%	35%	38%	-21%	-35%	-54%

## ● Latin America &amp; Caribbean

Where we are heading  
**Planned Energy  
Scenario 2016 - 2050**  
(PES)

Where we need to be  
**Transforming Energy  
Scenario 2016-2050**  
(TES)

**Energy system investments (average annual, 2016-50) USD billion/year**

	Where we are heading Planned Energy Scenario 2016 - 2050 (PES)	Where we need to be Transforming Energy Scenario 2016-2050 (TES)
Power	39	45
– Renewable	21	28
– Non-renewable	5	3
– Power grids and system flexibility	13	15
Industry (RE + EE)	7	11
Transport (electrification + EE)	10	19
Buildings (RE + EE)	29	42
Biofuel supply	2.4	2.5
Renewable hydrogen – electrolyzers	0.03	0.5



Note: RE = renewable energy; EE = energy efficiency

The findings in this report consider targets and developments as of April 2019. The wind and solar PV capacities in the Transforming Energy Scenario in 2030 in this report are slightly higher than the estimates presented in IRENA's reports (IRENA, 2019c; 2019d) which consider developments as of the third quarter of 2019.

**SOCIO-ECONOMIC OUTLOOK TO 2050**

## ● Latin America &amp; Caribbean

2019e      2030      2050

	2019e	2030	2050
Population (thousands) region-wide	474 076	505 546	535 802

**GDP (USD 2015)**

GDP (million): PES	3 679 104	5 158 950	13 240 587
GDP (million): TES	3 700 954	5 194 779	13 563 681
GDP changes (million): TES vs. PES	21 850	35 828	323 093
GDP changes (%): TES vs. PES	0.6	0.7	2.4
Per capita GDP (thousand): PES	7.8	10.2	24.7
Per capita GDP (thousand): TES	7.8	10.3	25.3

**Employment****Economy-wide employment (thousands)**

Employment: PES	272 097	282 324	251 102
Employment: TES	272 239	281 399	250 700
Employment changes: TES vs. PES	143	-925	-402
Employment changes (%): TES vs. PES	0.05	-0.33	-0.16



## ● Latin America &amp; Caribbean

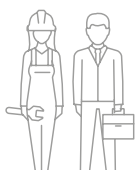
2017	2030 (PES)	2050 (PES)	2030 (TES)	2050 (TES)
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**Energy sector jobs (thousands)**

Nuclear power	8	12	8	10	6
Fossil fuels	1180	1104	953	962	700
Renewables	2 027	2 575	2 585	3 295	3 212
Energy efficiency	887	870	735	1211	818
Power grids and energy flexibility	364	466	403	463	455
<b>Total</b>	<b>4 467</b>	<b>5 026</b>	<b>4 685</b>	<b>5 941</b>	<b>5 190</b>
Energy jobs in economy-wide employment (%)		1.80%	1.90%	2.10%	2.10%

**Renewable energy jobs (thousands)**

Bioenergy	1 620	1 971	1 875	2 331	2 133
Solar	64	173	301	474	570
Hydropower	300	320	264	351	306
Wind	42	109	143	136	199
Geothermal	1	2	2	2	4
Ocean	0	0	0	0	0
<b>Total</b>	<b>2 027</b>	<b>2 575</b>	<b>2 585</b>	<b>3 295</b>	<b>3 212</b>
Renewable energy jobs in energy-sector employment (%)		51.2%	55.2%	55.5%	61.9%


**Job differential in 2050 (thousands) TES vs. PES**

Economy-wide	-402
Changes in conventional energy (A)	-255
Changes in transition related technologies (B)	761
<b>Net jobs (A+B)</b>	<b>506</b>

## ► Jobs in 2050: TES / ● Latin America &amp; Caribbean

Technology jobs (thousands)		Segment value chain (thousands)		Occupational requirements (thousands)	
Solar PV	276	Construction & installation	372	Workers and technicians	631
Solar water heaters (SWH)	293	Manufacturing	225	Experts	64
Onshore wind	195	Operation and maintenance	174	Engineers and higher degrees	52
Offshore wind	5	Biofuel supply	-	Marketing and administrative	25
Geothermal	4				
<b>Total</b>	<b>771</b>		<b>771</b>		<b>771</b>

Welfare improvement (%):  
TES vs. PES

Indicator	2030		2050	
	Value	Value	Value	Value
Economic	-0.1		0.2	
Social	2.8		10.0	
Environmental	2.2		4.6	
<b>Total</b>	<b>5.0</b>		<b>14.8</b>	



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