

ZERO CARBON

L A T I N A M E R I C A A N D T H E C A R I B B E A N

**"THE OPPORTUNITY, COST AND BENEFITS OF THE COUPLED
DECARBONIZATION OF THE POWER AND TRANSPORT SECTORS
IN LATIN AMERICA AND THE CARIBBEAN"**

UN 
environment
programme



THE OPPORTUNITY, COST AND BENEFITS OF THE COUPLED
DECARBONIZATION OF THE POWER AND TRANSPORT SECTORS
IN LATIN AMERICA AND THE CARIBBEAN.

DECEMBER 2019





Published by the United Nations Environment Programme (UN Environment Programme), May 2020.



Attribution-
NonComercial-
NoDerivatives
CC BY-NC-ND

This publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder, when provided acknowledgement of the source is made. UN Environment Programme would appreciate receiving a copy of any publication that uses this publication as a source. No use of this publication may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from the United Nations Environment Programme. Applications for such permission, with a statement of the purpose and extent of the reproduction, should be addressed to the Director, División de Comunicación, Programa de la ONU para el Medio Ambiente, Oficina para América Latina y el Caribe, Edificio 103, Calle Alberto Tejada, Ciudad del Saber, Clayton, Panamá.

Disclaimer

The mention of a company or commercial product in this document does not imply endorsement by UN Environment Programme or the authors. The information in this document may not be used for advertising or marketing purposes. Trademark names and symbols are used editorially without intent to infringe trademark or copyright laws. The relationship between the United Nations Environment Programme and Iberdrola S.A. is limited to co-funding the report. The collection of information, the writing of the report and its publication are carried out independently and do not in any way reflect the views of the funders, including the European Union, AECID or Iberdrola. The United Nations Environment Programme is not responsible for any actions or verbal positions taken by them before, during or after this partnership. The views expressed in this publication are those of the authors and do not necessarily reflect the views of the United Nations Environment Programme. We regret any errors or omissions that may have been inadvertently made.

© Photographs and illustrations as specified

This document may be cited as: Zero Carbon: The opportunity, cost and benefits of the coupled decarbonization of the power and transport sectors in Latin America and the Caribbean. UN Environment Programme, Office for Latin America and the Caribbean, Panama.

ACKNOWLEDGEMENTS

Lead authors

- Walter Vergara

Senior fellow with WRI, under a sabbatical assignment with UNEP for the purposes of report analysis and preparation.

- Jorgen Fenhann

Senior scientist at the Technical University of Denmark. He is a member of the UNEP DTU partnership. He is the creator and manager of GACMO.

- Silvia R. Santos da Silva

Researcher with the Global Change Center at the University of Maryland.

UN Environment Programme's Latin America and the Caribbean Office Coordinating review committee.

Climate Change Unit:

Led by: **Gustavo Mañez**, Climate Change Coordinator, Latin America and Caribbean Office.

Contributing authors: **Mercedes García Farina**, **Elizabeth Font**.

Reviewers: **Esteban Bermudez**, **Sebastián Carranza**, **William Holness**, **Rosilena Lindo**, **Agustín Matteri**, **Juan Luis Pardo** and **Jonnatan Rico**.

Delegated Chief Scientist:

Francesco Gaetani, Environment under review subprogram regional coordinator, UNEP.

Regional Gender Focal Point:

Piedad Martin, Deputy Regional Director.

External reviewers

Monica Araya, Co-founder of Costa Rica Limpia.

John Christensen, Director of UNEP DTU Partnership.

Gianni Lopez, Director at Mario Molina Center of Chile. **Marta Martínez**, Head of Studies at the Energy Policies and Climate Change Division, Iberdrola.

Horst Pilger, Head of the Climate Change and Environment Section at the European Commission's Directorate-General for International Cooperation

and Development (DG DEVCO). **Miguel Ángel Rubio**, CEO of Acciona Energía Mexico. **Carlos Salle**, Director of Energy Policy and Climate Change at Iberdrola. **Thorsten Schulz**, Investment Manager at Aravis Ventures. **Ignacio Santelices Ruiz**, Director Ejecutivo Agencia de Sostenibilidad Energética de Chile.

External contributors

UNEP/DTU partnership team in Copenhagen, led by its Director John Christensen. Iberdrola's **Energy Policy and Climate Change team** led by its Director Carlos Salle. **Jennifer Layke**, **Alex Perera** and **Katie Pastor** at WRI. **Johannes Friedrich** and **Mengpin Ge** at WRI for their help with information from and access to the CAIT database. **Sergio Avelleda** for information from the BRT database. **Tina Huang** and **Emily Nilson** for assistance with retrieval of information from Resource Watch. **Katherine Segura** and **Byron Chiliquinga** for their assistance in the collection of the load curves of power demand in the region. **Tulio Alves** Executive Director of the Commission for Regional Energy Integration. **Fernando Miralles**, Executive Director, Cooperative Institute for Climate and Satellites and Interim Director of the Earth System Science Interdisciplinary Center at the University of Maryland and **Leon Clark** at the Pacific Northwest National Laboratory for facilitating access to GCAM.

Case studies' contributors

Mónica Araya, **Andrés Barentin**, BMW, EPEC (Argentina), La Casa de las Baterías (Panama), Ministry of Industry and Energy (Uruguay), ENSA (Panama), Ministry of Production and Labor (Argentina), NAVANTIA, Neoenergía.

Media and launch support

Ivonne M. Rodríguez, UN Environment Programme

Design and Layout

Karla Delgado, UN Environment Programme

Edition

Katie Pastor, WRI

Funders

The following organizations provided funding to produce Zero Carbon Latin America and the Caribbean report: Iberdola, the European Union through the EUROCLIMA+ Programme and the Government of Spain.



Partners

Zero Carbon Latin America and the Caribbean report counted with the contribution of: DTU Partnership and University of Maryland



CONTENTS

- 9 Abbreviations
 - 10 Foreword by the United Nations Environment Programme
 - 11 Foreword by the European Commission
 - 13 Foreword by the Ministry for Ecological Transition and Demographic Challenge, Government of Spain.
 - 15 Prologue
- 16 SUMMARY FOR DECISION MAKERS**
- 17 Introduction
 - 20 The current status of the LAC region power and transport sectors under a BAU scenario
 - 20 Power sector
 - 23 Transport sector
 - 25 The evolving economics of renewable energy in the region
 - 28 Transmission and distribution
 - 30 Technology and economic trends of electric transport
 - 34 Benefits and economic costs of a coupled decarbonization
 - 34 Reduced capital investment requirements
 - 37 Lower electricity and rolling stock costs
 - 39 Combined lower energy demand
 - 40 Energy security
 - 41 Impact on power sector loads and size
 - 42 Impact on refining operations and stranding of capital assets
 - 43 Health benefits
 - 46 Jobs and enterprise creation
 - 48 Policy options for an accelerated transition

54 CHAPTER 1 Introduction

- 55 Present context
- 62 Data sources and methods

63 CHAPTER 2 The current and future status of the LAC region power and transport sectors under a BAU scenario

- 64 Power sector
 - 64 Recent trends
 - 65 Sources of electricity generation and its carbon footprint
 - 67 Country typology
 - 69 Future power demand
- 71 Transport sector
 - 71 Recent evolution of the transport sector
 - 73 Passenger transport
 - 75 Cargo transport
 - 78 Energy efficiency and carbon footprint
 - 80 Future demand

83 CHAPTER 3 The evolving economics of renewable energy in the region

- 84 Resource endowment
- 86 Evolution of capacity by country and cost structure of renewable resources
- 89 Cost evolution of non-conventional renewables
- 93 Projected costs of generation in the region
- 95 Investments trends in the region
- 97 Tipping point for decision making in Latin America and the Caribbean power market

100 CHAPTER 4 Transmission and distribution

- 101** Structure of transmission and distribution
- 109** Power storage
- 114** Grid integration
- 116** Characteristics and benefits of a smart integrated grid in the region

117 CHAPTER 5 Technology and economic trends of electric transport

- 119** Passenger vehicles
- 120** Cargo transport
- 121** Marine vehicles
- 121** Charging facilities
- 123** Projected costs of electric transport in the region.

126 CHAPTER 6 Challenges and opportunities of a coupled transition

- 127** Energy security
- 130** Impact on power generators (load balancing)
- 131** Health benefits
- 134** Impact on refining operations
- 136** The stranding of capital assets from power generation and refining

140 CHAPTER 7 Pathway to a coupled decarbonization of power and transport

- 141** Decarbonization of power sector
- 146** Electrification of the transport sector

150 CHAPTER 8 Jobs, education and enterprise creation

- 151** Job creation.
 - 151** Solar energy
 - 153** Wind energy
 - 153** Electric batteries
 - 154** Electric vehicle manufacture and assemblage
 - 154** Grid modernization
 - 155** Job losses
- 155** Estimated additional jobs generated regionally under the intervention scenario
- 156** Enterprise creation
- 157** New business models to progress towards a coupled decarbonization of power and transport sectors by 2050
 - 158** Utilities
 - 162** Large renewable power plants
 - 162** Utilities-scale energy storage
 - 164** Oil companies' investment in renewables
 - 165** Distributed generation and storage behind-the-meter
 - 167** Digital services
 - 171** Higher utilization rate of vehicles
 - 173** Non-traditional actors in electromobility
 - 176** V2X
 - 178** Sustainable Value Chain for lithium

180 Implications for training and education

180 A just transition

- 186 Policy agenda for power sector transition**
 - 188 Decarbonization measures
 - 191 Decentralization measures

- 195 Policy agenda and measures for electric transport**
 - 195 All-segment commercial vehicles
 - 198 Charging infrastructure

- 201 Policies for a coupled transition**

- 205 Conclusions**
 - 207 Decarbonization of the power sector
 - 209 Electrification of the transport sector
 - 212 Benefits from a coupled transition by 2050

- 213 List of references.**

- 219 Annexes.**
 - 219 Annex 1
 - 223 Annex 2
 - 225 Annex 3
 - 226 Annex 4
 - 227 Annex 5
 - 224 Annex 6
 - 230 Annex 7

预览已结束，完整报告链接和二维码如下：

https://www.yunbaogao.cn/report/index/云报告?reportId=5_13720

