Environment and Energy Landscape in Latin America and the Caribbean: An Analysis of Trends 2020-2030

Increased Planetary Health Issues

December 2020
“Planetary Health is an emerging field focused on understanding the human health implications of the anthropogenic disruption and transformation of our planet’s natural systems”
– Planetary Health Alliance

There is growing evidence that environmental degradation has wide-ranging impacts on human health

### Health-Related Challenges

<table>
<thead>
<tr>
<th>Environment-Related Problems</th>
<th>Non-Communicable Diseases</th>
<th>Infectious Diseases</th>
<th>Nutrition</th>
<th>Displacement</th>
<th>Mental Health</th>
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<tbody>
<tr>
<td>Deforestation</td>
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<td>Biodiversity Shifts</td>
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<td>Changing Food Systems</td>
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<td>![Snowflake]</td>
<td>![Clock]</td>
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<td>![Headache]</td>
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<td>Natural Disasters</td>
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<td>![Snowflake]</td>
<td>![Clock]</td>
<td>![Person]</td>
<td>![Headache]</td>
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| Examples                     | Cardiovascular diseases, respiratory diseases | Dengue, Zika, malaria, COVID-19, SARS | Malnutrition, obesity, food Insecurity | Forced migration, civil strife | Anxiety |

There are a host of planetary health challenges in LAC; diseases stemming from changes in vector ecology and air pollution are among the most acute

From 1980 to 2016, more than 4,000 natural disasters, affecting 297 million people and killing 290 thousand

Air pollution is associated with around 6% of deaths in LAC, compared to 4% in high income countries

A 10% increase in deforestation in the Amazon region contributed to a 3.3% increase in malaria incidence between 2003-2015 and was linked to other diseases such as diarrheal disease in children

50-60% of Central America’s annual harvests have been lost due to water scarcity and higher temperatures, putting over 3.6 million people in conditions of food insecurity

Higher temperatures are driving vector-borne diseases (VBD) outbreaks in unprecedented high-altitude locations in countries like Peru, Ecuador, Colombia, Bolivia, Venezuela

The Amazon is the region in the world with the most undiscovered zoonotic diseases transmitted by wild mammals such as bats

Given their threat to human health, interdependence with other environmental trends, and alignment with USAID experience, this report will focus on diseases resulting from changes in vector ecology (e.g., dengue, malaria, chikungunya, Zika) and air pollution (e.g., cardiovascular and respiratory issues)

DISEASES FROM CHANGES IN VECTOR ECOLOGY
A host of changes driven by human activities in LAC are contributing to the increased frequency and severity of vector-borne disease (VBD) outbreaks

<table>
<thead>
<tr>
<th>Ecosystem Change</th>
<th>Vector Ecological Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Average temperature and variability</td>
<td>• Breeding places</td>
</tr>
<tr>
<td>• Rainfall and humidity</td>
<td>• Carrier survival probability</td>
</tr>
<tr>
<td>• Amount and duration of sunlight</td>
<td>• Density</td>
</tr>
<tr>
<td>• Water currents</td>
<td>• Biting rates</td>
</tr>
<tr>
<td>• Soil quality</td>
<td>• Resistance to insecticide</td>
</tr>
<tr>
<td>• Vegetation</td>
<td>• Ability to adapt to and survive in urban spaces</td>
</tr>
<tr>
<td>• Fauna</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Human-Related Change</th>
<th>Parasite Ecological Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Population density</td>
<td>• Incubation period</td>
</tr>
<tr>
<td>• Immigration of non-immune people</td>
<td>• Resistance to drugs</td>
</tr>
<tr>
<td>• Spread of pathogens</td>
<td></td>
</tr>
<tr>
<td>• Nutritional status</td>
<td></td>
</tr>
</tbody>
</table>

LAC faces high risk of infections from VBDs, particularly in the Caribbean, Central America, and countries like Brazil and Colombia.

Regional and National Hazard and Exposure to VBDs (Index, 0 to 10 where 10 is the highest risk)

- **Mexico:** 7.1
- **El Salvador:** 7.9
- **Nicaragua:** 8.1
- **Haiti:** 8.1
- **Colombia:** 8.0
- **Brazil:** 8.8
- **Peru:** 6.9
- **Caribbean:** 7.5
- **Central America & Mexico:** 7.3
- **Andean Region:** 7.2
- **Southern Cone:** 6.3

**Global Average:** 4.8

The “Hazard and Exposure to Vector-Borne Diseases” indicator represents the probability of exposure to infectious agents for diseases such as malaria, Zika, dengue, chikungunya, yellow fever and West Nile fever.

LAC faces high risk of infections from VBDs, particularly in the Caribbean, Central America, and countries like Brazil and Colombia

<table>
<thead>
<tr>
<th>Key Locations</th>
<th>Total Cases in the Last 5 Years (million)</th>
<th>DALYs per 100k People</th>
<th>Recent Evolution in LAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dengue</td>
<td>Brazil, Mexico, Colombia, Nicaragua, and Honduras</td>
<td>10.6</td>
<td>21.9</td>
</tr>
<tr>
<td>Malaria</td>
<td>Venezuela, Brazil, Colombia, Peru and Haiti</td>
<td>3.0</td>
<td>79.4</td>
</tr>
<tr>
<td>Chikungunya</td>
<td>Brazil, Panama, Bolivia, Colombia, and El Salvador</td>
<td>2.9</td>
<td>25.4</td>
</tr>
<tr>
<td>Zika</td>
<td>Brazil, Colombia, Venezuela, Honduras and Martinique</td>
<td>0.9</td>
<td>5.1</td>
</tr>
<tr>
<td>Leishmaniasis</td>
<td>Brazil, Colombia, Peru, Nicaragua, and Bolivia</td>
<td>0.3</td>
<td>273.1</td>
</tr>
</tbody>
</table>

Disability-adjusted life years (DALYs), is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. As a reference, DALYs per 100k people for appendicitis in LAC is 24 and diabetes mellitus is 839.

Vector-borne diseases also have economic and social implications, particularly for the most vulnerable populations (1 of 2)

- **Dengue and malaria** cost the region more than $3 billion and $2 billion per year, respectively, given strains on health systems, reduced employment, decreased workers productivity, etc.

- **Zika** is estimated to have caused economic losses of between $7 and $18 billion from 2015–2017 across LAC, largely driven by impacts on the tourism industry.

Vector-borne diseases also have economic and social implications, particularly for the most vulnerable populations (2 of 2)

Social

• **Women and children in rural areas are particularly affected by VBDs,** as they are usually more exposed due to assigned roles within households such as collecting water

• **Gender inequality in healthcare access and nutrition** as well as factors like menstruation and pregnancy, make women less immune than men to dengue

• **Indigenous populations are frequently marginalized** with lower access to basic household services and healthcare, making them **more vulnerable to VBD infections**

• **VBDs can have acute consequences in pregnant women and their babies,** as is the case of **Zika and the microcephaly syndrome associated with it**

A few approaches to address the consequences and environment-related causes of VBDs show promise (1 of 3)

Water Supply and Management

Solution:
Reliable potable water supply decreases the need for water-storage containers that serve as larval habitats. Water-storage containers can also be designed to prevent access by mosquitoes to deposit eggs. As this solution involves basic services provision, close collaboration with local governments is key.

Example:
Partnership with local communities in Veracruz, Mexico to adopt safe water-collection systems. This project decreased dengue incidence in the region.

Impacts:
Increased availability of potable water for rural communities and overall reduction of dengue disease burden.

A few approaches to address the consequences and environment-related causes of VBDs show promise (2 of 3)

Mosquito Habitat Management

Solution:
Seeks to prevent or minimize vector propagation by destroying, altering, or removing water accumulations that provide larval habitats

Example:
Wetland draining and mosquito-ditching to remove standing water have been effective in the Peruvian Amazon to reduce malaria transmission, although risks of affecting ecosystems and causing losses of other species though these practices must be assessed

Impacts:
Reduced concentration of favorable habitats for mosquito reproduction and decreased vector population

A few approaches to address the consequences and environment-related causes of VBDs show promise (3 of 3)

Insecticide-Treated Nets (ITN)

Solution:
An ITN repels, disables or kills mosquitoes. ITNs can produce a “community effect” because of their impact on mosquito longevity and therefore vectorial capacity.

More recent generations of ITNs must be introduced, as moderate resistance has been reported on older models.

Example:
ITNs have been successfully implemented in regions of Colombia, Ecuador, Peru, Venezuela, and Nicaragua with presence of malaria vectors.

Impacts:
Reduced child mortality by 83% and reduced severe malaria episodes by 56%.

CASE STUDY | Introduction of Natural Bacteria to Decrease Transmission of VBDs

“By breeding mosquitoes that carry safe and natural Wolbachia bacteria, we can effectively prevent diseases from spreading in whole cities and even regions. Our evidence shows that in areas where Wolbachia is self-sustaining at a high level, there have been no dengue outbreaks”
– World Mosquito Program

Challenge:
• In recent years, population growth, the movement of people from rural areas to cities, more international travel, and climate change have all increased the spread of Aedes aegypti mosquitoes, which carry viruses like dengue, Zika, chikungunya, and yellow fever

Approach to Adress the Challenge
• When Aedes aegypti mosquitoes carry the natural bacteria Wolbachia, the bacteria compete with the viruses. This makes it harder for viruses to reproduce inside mosquitoes and makes them much less likely to spread diseases
• “The World Mosquito Program breeds Wolbachia-carrying mosquitoes and, in partnership with local communities, releases them into areas affected by mosquito-borne diseases”
• Independent risk analyses indicate that the release of Wolbachia-infected mosquitoes poses negligible risk to humans and the environment. The program has received regulatory approval in all countries where Wolbachia-carrying mosquitoes have been released

Outcomes:
• Brazil: “dengue incidence ↓ 42–74% and chikungunya incidence ↓ 21–74%”
• Colombia: “No dengue outbreaks in Wolbachia-treated areas of city-wide deployments”

HEALTH ISSUES FROM OUTDOOR AND INDOOR AIR POLLUTION
A host of factors are driving outdoor and indoor air pollution in LAC, which are leading to serious health issues.

**Main Drivers**

**Outdoor Air Pollution**
- Transportation
- Electricity Generation
- Industry
- Other sectors (e.g., commerce, agriculture, construction)

**Indoor Air Pollution**
- Cooking and heating with solid and liquid (e.g., kerosene) fuels
- Others (e.g., tobacco, building materials, products for household cleaning)

**Outcomes**
- Cardiovascular diseases
- Chronic obstructive pulmonary disease and acute lower respiratory infections
- Lung Cancer

Sources:
Air pollution can lead to a variety of serious health issues for people at different stages of life.

**Health Impact through Lifetime**

**Pregnancy**
- Low birth weight
- Premature birth
- Stillbirth

**Children**
- Asthma
- Slower development of lung function
- More wheezing and coughs
- Start of atherosclerosis

**Adults**
- Asthma
- Coronary heart disease
- Stroke
- Lung cancer
- Chronic obstructive pulmonary disease
- Diabetes

**Elderly**
- Asthma
- Accelerated decline lung function
- Lung Cancer
- Diabetes
- Dementia
- Heart attack, heart failure, and stroke

While death rates from outdoor air pollution have declined across LAC, rates remain high and progress has been uneven.

**National Outdoor Air Pollution Death Rates (OAPDR)**

**Annual Deaths per 100,000 People**

<table>
<thead>
<tr>
<th>Year</th>
<th>Andean Region</th>
<th>Caribbean</th>
<th>Southern Cone</th>
<th>Latin America and the Caribbean</th>
<th>Central America &amp; Mexico</th>
<th>Caribbean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
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<td>2016</td>
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<td>26</td>
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<td>25</td>
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<td>2018</td>
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<td>25</td>
<td>29</td>
<td>25</td>
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</table>

**Overview of Health Impacts from Outdoor Air Pollution in LAC**

Air pollution has been consistently among the top 3 causes of death in the region.

Death rates from outdoor air pollution in LAC (26 per 100,000 people) are below the world average (44), but above the level for high-income countries (17).

Despite the regional trend, deaths from outdoor air pollution are increasing in Jamaica, El Salvador, and the Dominican Republic.

**New Asthma Cases due to Air Pollution Exposure per Year, per 100,000 Children**

- Sub-Saharan Africa: 114
- Central America & Mexico: 200
- Latin America and the Caribbean: 260
- South America: 280
- Caribbean: 315

Source: N. Grima et al, Payment for ecosystem services (PES) in Latin America: Analyzing the performance of 40 case studies, 2016.
Death rates from indoor air pollution have also declined, yet a few countries continue to face relatively high rates

Overview of Health Impacts from Indoor Air Pollution in LAC

- In the last decade, deaths for indoor air pollution have decreased 30% in Haiti, Guatemala, Honduras, Paraguay, Nicaragua and Bolivia, but it remains ~4X times higher than the region’s average
- Deaths from indoor air pollution in LAC are considerably higher than in high-income countries (9.3 vs. 0.2 deaths per 100,000 people in 2017)
- In Guatemala, cooking with traditional cookstoves and solid fuels is associated with a 30% increase in severe pneumonia among children < 18 months
- In Peru, the use of cleaner cookstoves is associated with a 25% decrease in respiratory symptoms and attention deficits in children 2-14 years old

National Indoor Air Pollution Death Rates (IAPDR)

Annual Deaths per 100,000 People

Health impacts caused by air pollution in LAC also have economic and social implications

<table>
<thead>
<tr>
<th>Outdoor Air Pollution</th>
<th>Indoor Air Pollution</th>
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<tbody>
<tr>
<td><strong>Economy</strong></td>
<td><strong>Social</strong></td>
</tr>
<tr>
<td>• “Current welfare costs” from premature deaths due to air pollution in LAC account for $80 billion and will continue to increase up to $470 billion in 2060,” including economic support to people out of work and healthcare costs</td>
<td>• Rural and indigenous populations (who are typically more exposed to indoor vs. outdoor air pollution) suffer a particularly high burden from respiratory issues due to economic insecurity and low access to healthcare</td>
</tr>
<tr>
<td><strong>Children</strong></td>
<td><strong>Women</strong>: Particularly affected as they are frequently in charge of cooking activities and more present in areas with high migration rates, such as Haiti, Guatemala, and Honduras</td>
</tr>
<tr>
<td>• Children are particularly vulnerable to air pollution because their bodies are less able to metabolize, detoxify, and excrete the toxicants</td>
<td>• People with cardiovascular and/or respiratory disease: Chronic morbidity of these kinds of diseases make individuals, who are generally in a more disadvantaged economic condition, more susceptible to experiencing acute consequences from air pollution</td>
</tr>
<tr>
<td>• People with cardiovascular and/or respiratory disease: Chronic morbidity of these kinds of diseases make individuals, who are generally in a more disadvantaged economic condition, more susceptible to experiencing acute consequences from air pollution</td>
<td>• Rural and indigenous populations: Limited access to cultural norms around clean cooking technologies increase exposure to air pollution and limited access to healthcare services makes air pollution impacts more acute for them</td>
</tr>
</tbody>
</table>

Approaches to address the consequences and environment-related causes of air pollution show promise (1 of 3)

**Upgrading Industrial Technology**

**Solution:**
Incorporating best practices or upgrading to the best available technologies in industrial processes. These measures can be deployed quickly and implemented through sector-targeted policies by encouraging and regulating the change.

**Example:**
Argentina and Brazil have both begun installing supermarket refrigeration systems utilizing mainly CO₂ and ethylene glycol instead of hydrofluorocarbons. Colombia is installing district cooling in the city of Medellin as part of its old-chillers replacement project.

**Impacts:**
- Reductions in air pollutants
- Improved production efficiency

Approaches to address the consequences and environment-related causes of air pollution show promise (2 of 3)

**Efficient Transportation Systems**

**Solution:**
Renewal of the bus fleet with energy-efficient technology and cleaner fuels, providing alternative non-motorized transportation options and freight management. Enhancement of urban transit systems requires strong commitment and combined efforts and investment on behalf of local authorities and transport operators.

**Example:**
Through a fiscal incentive applicable when replacing freight units more than ten years old and for vehicles less than six years old, Mexico has eliminated more than 25,000 older units.

**Impacts:**
- Reductions on black carbon, methane, and hydrofluorocarbon

Approaches to address the consequences and environment-related causes of air pollution show promise (3 of 3)

Behavioral Change Campaigns

Solution:
Encouraging behavioral changes such as clean domestic cooking practices; halting slash-and-burn practices in agriculture; and using less polluting kilns in artisanal brick production. Practices are often deeply embedded in cultural, economic, and social traditions, so the process of change may be lengthy and complex

Example:
EcoMal, Doña Dora, and Chispas stoves leverage multichannel communication campaigns to drive behavior change in Guatemala

Impacts:
- Reduced exposure to pollutants
- Reduced deforestation

CASE STUDY | Social Enterprise to Increase Local Production and Use of Clean Cookstoves

“These improved cookstoves are durable, cost-effective and meet all the family’s cooking needs. Families save money by buying less wood or save time gathering wood, rid the house of smoke and reduce emissions” – Proyecto Mirador

Challenge
- 81% of rural households in Honduras use firewood for cooking
- More than 4 million people are affected by household air pollution
- “Open-fire cooking is wasteful, dirty, dangerous, and slow”
- Despite the obvious benefits, clean cookstoves have only achieved a 12% market penetration in Honduras

Approach to Address the Challenge
- Mirador is a franchise-like social enterprise system in which entrepreneurs are paid for building stoves
- Users’ priorities have been taken into account, families are trained, stove designs are robust, and stoves are monitored and maintained
- The family does not pay in cash. They share in the cost of the stove by providing materials (worth about $12-15) and time

Outcomes
- One stove saves 15 tons of carbon pollution
- Almost 200,000 stoves have been installed
- “79% reduction in carbon monoxide and particulate matter inside the home”
- 172 direct and indirect employees

CALLS TO ACTION
CALLS TO ACTION | A holistic, cross-sectoral approach is needed to tackle the underlying drivers of increased planetary health issues

The underlying drivers of environmental challenges are often systemic issues rooted in local economic, social, and cultural realities that are deeply challenging to address.

Making progress on these challenges often requires cross-cutting approaches that draw on resources and capabilities from local communities themselves along with support from government, private sector, civil society, academia, and donors.

The high-level ideas outlined in this section are often interdependent; they need to be implemented in tandem in order to be effective.

They also require a keen understanding of local context to determine whether and how they might apply given the size and diversity of the region.

Source: Dalberg analysis
Calls to action | Reducing environment related health issues in LAC requires action and collaboration across sectors (1 of 7)

Support sustainable livelihoods

- Support economic opportunities for communities whose economic insecurity forces them to engage in activities related to environmental health risks (deforestation, hunting wildlife, driving highly polluting cars)

Strengthen monitoring and tracking

- Implement monitoring stations to have real time data of air pollution levels
- Implement early detection systems in areas with high proximity to vectors and other wildlife

Strengthen regulatory framework and its application/enforcement

- Legislation to regulate fuels (avoid low quality fuels) and old vehicles (restrict circulation of old vehicles)
- Phase out unsustainable agricultural practices
- Develop and implement stronger biosecurity measures (e.g., biosecurity policies across the food chain)
- Develop national clean cooking plans
Calls to action | Reducing environment related health issues in LAC requires action and collaboration across sectors (2 of 7)

Expand utilities/public services coverage and quality of services

• Improve health governance with a planetary health approach by engaging environmental stakeholders
• Improve access to clean water and sanitation (i.e., decrease breeding sites for vectors)
• Increase access to other energy sources for cooking (i.e., provide options for a transition to cleaner fuels)
• Develop clean public transportation systems

Promote planetary health education to increase society’s awareness of the relationship between the environment and human health

• Build awareness of potential risks of air pollution (e.g., cooking with open fires) and factors that increase risk of vector-borne disease spread (e.g., proximity to stagnant water)

Promote participation of communities

• Champion the integration of local communities into policymaking and implementation from early stages and onwards
Calls to action | Reducing environment related health issues in LAC requires action and collaboration across sectors (3 of 7)

Private sector

Develop and adhere to voluntary guidelines and standards (e.g., SDG Impact Practice Standards for PE Funds)

- Implement policies to reduce emission and environmental degradation
- Track progress toward standards with independent/third party evaluations

Product innovation and business models

- Develop and offer improved cookstoves that are both high quality and affordable
- Develop more sustainable energy appliances that are more energy efficient (and cost savings for the company)
- Support research and development of vaccines for crucial vector-borne diseases
Calls to action | Reducing environment related health issues in LAC requires action and collaboration across sectors (4 of 7)

Promote participation of communities
- Champion the integration of local communities into project planning and implementation from early stages and onwards

Drive behavioral change
- Address economic drivers for modifying cooking patterns and transition to cleaner energy sources or cleaner technologies (biomass improved cookstoves)
- Create incentives and offer access to new technologies for modifying water storage behavior and avoiding breeding sites for vector diseases
- Catalyze at-scale production of vaccines, treatments, and tests
Calls to action | Reducing environment related health issues in LAC requires action and collaboration across sectors (5 of 7)

**Innovate**
- Develop vector control techniques (e.g., genetic modifications, bacteria) that can decrease vector transmission rates
- Partner with the government and private sector to develop at-scale vaccines and medicine to treat emerging diseases

**Research**
- Expand scientific inquiry into the environmental dimensions of zoonotic diseases
- Develop research to better quantify the impact of environmental degradation on human health
- Create cross-disciplinary departments of research groups on Planetary Health challenges
Calls to action | Reducing environment related health issues in LAC requires action and collaboration across sectors (6 of 7)

Support governments in expanding monitoring systems

- Increase surveillance and control of areas (both for vector diseases and air pollution)
- Provide tools, training, and best practices to local authorities, including monitoring program implementation

Build awareness and research

- Build awareness on key stakeholders from the public, private, and philanthropic sectors about the relationship between environmental degradation and human health
- Fund research activity to address knowledge and capacity related to planetary health (e.g., similar to IDEAL in the food and nutrition security space)
Calls to action | Reducing environment related health issues in LAC requires action and collaboration across sectors (7 of 7)

Promote private sector engagement and partnerships

- Support governments when developing incentives/taxes that encourage market-based approaches i.e., transition to biomass improved cookstoves in rural areas cooking with open fires
- Deploy blended-finance mechanisms to mobilize private funding toward cross-sectoral investments in conservation, education, health, sustainable tourism, sustainable agriculture, etc. (e.g., USAID HEARTH)

Facilitate the exchange of knowledge across countries

- Disseminate learnings from other Missions worldwide that have supported prevention and recovery from vector-borne diseases to bring best practices that can help countries prepare for future outbreaks
- Disseminate learnings and best practices in terms of programs aiming to reduce air pollution e.g., USAID Clean Air Green Cities project in Vietnam
THANK YOU

USAID

FROM THE AMERICAN PEOPLE