

## City Net Zero Profile: Villavicencio

With a metropolitan population of 500,000, Villavicencio the 10<sup>th</sup> largest city in Colombia. It is the 64<sup>th</sup> largest in Latin and Central America and the Caribbean, and the 487<sup>th</sup> largest city globally.<sup>1</sup>

<b>Core City Population</b>	450,000
<b>Wider Metropolitan Area Population</b>	500,000

This snapshot examines Villavicencio potential to accelerate towards 'net zero'. It assesses:

1. How enabling is the city's current endowment to decarbonise (inherited assets).
2. Ambition and strategy for a low carbon future.
3. Span of powers and influence to accelerate decarbonisation initiatives.
4. The platforms and projects underway that can support a lower carbon future.
5. The investment and business innovation environment to promote decarbonisation.

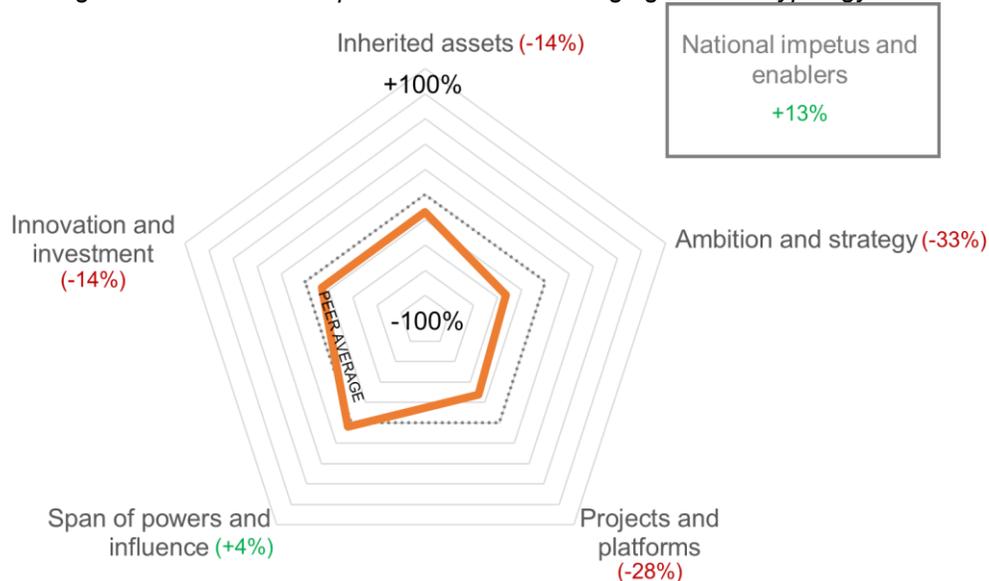
These 5 dimensions are explored in the summary statements below.

### Summary and key findings

By global and regional standards, Villavicencio is:

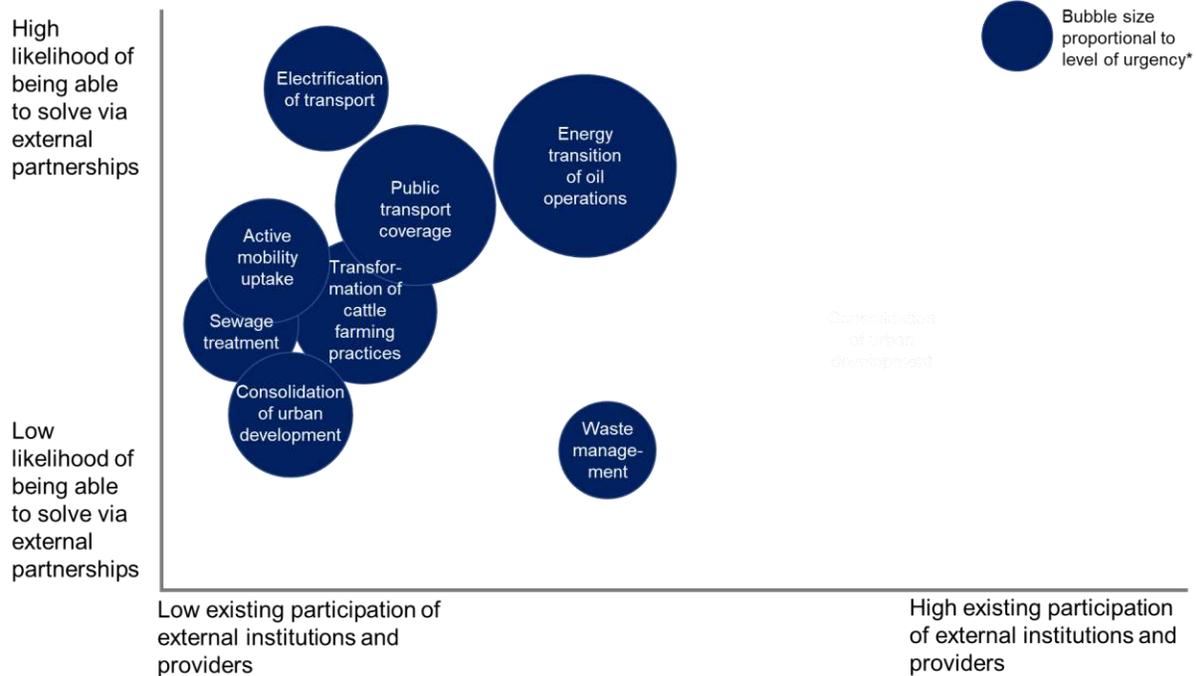
Assets	<b>A Net Zero Challenger.</b> The city inherits a more carbon-intensive economy and an urban form that requires bigger and bolder innovations for net zero restructuring.
Ambition	<b>Net Zero Cautious.</b> Modest strategies among public entities so far but room to increase ambition in key sectors such as transport, waste and sewage.
Powers	<b>Net Zero Reliant.</b> Some emerging evidence of integration, but outsized impact of oil and transport sectors means progress is likely to be reliant on the ambition and actions of private sector actors.
Projects	<b>Net Zero Steady.</b> Current projects likely to result in incremental progress, implying a long-term journey to net zero.
Innovation	<b>Net Zero Unsigned.</b> Modest relationships with multilateral development banks and limited alternative investment and innovation pathways so far.

Figure 1: Villavicencio's position within an emerging net zero typology



\*Based on initial data. Scores subject to change contingent on final checks and weightings. \*\*Peer average refers to average among all measured cities in Latin and Central America and the Caribbean, except for projects and platforms, where it refers to average among the 6 Chilean and Colombian cities. Full list of indicators for each theme provided in Appendix. Aggregate scores calculated using an ELO algorithm.

Figure 2: The main challenges facing Villavicencio in the journey to net zero



*\*Based on a combination of external comparative data and level of urgency as identified in current strategies and plans and/or by industry practitioners during interviews carried out in early 2021.*

Based on the comparative data and observed insights from strategies and practitioners, among the key priority areas for Villavicencio to accelerate towards net zero appear to be:

1. Decarbonisation of regional oil operations and transformation of cattle farming practices
2. Expansion and electrification of the public transport system to strengthen capacity
3. Consolidation of urban development via the introduction of mechanisms to support transport-oriented development and densification

Given these imperatives, the UK contribution has the potential to be most salient in the energy and transport sectors, especially in terms of:

1. Direct deployment of best-in-class solar design technologies to increase the efficiency of solar cells and help to support the decarbonisation of regional oil operations
2. Masterplanning expertise on the design of the new Mobility Master Plan, plus technical assistance to use digital software and IoT based solutions in order to optimise control and integration of the new mass transport system
3. Technical and policy assistance to develop and scale incentives for densification and compact development

## How well set up is Villavicencio to go net zero?

Table 1: Villavicencio's aggregate scores in terms of current endowment to shift to net zero

	Score relative to Latin America leader* (max = 1)	Latin American leader	Latin American laggard	Rank among Latin American cities
Track record of compact development	0.73	Guayaquil	Tijuana	24 <sup>th</sup> / 51
Transport systems efficiency	0.48	Santiago	Grande Sao Luis	44 <sup>th</sup> / 52
Urban canopy coverage and protection	0.38	Toluca de Lerdo	Tijuana	24 <sup>th</sup> / 26

\*Among all measured cities in Latin and Central America and the Caribbean. All indicators featured in each of the 3 main sub themes detailed in Appendix. Aggregate scores and ranks calculated using an ELO algorithm.

**Relative to other Colombian cities, Villavicencio's inherited assets are less conducive to decarbonisation.** More than other medium-sized Colombian cities, it has a larger presence of high emission industries, a more limited public transport system, and a lower density built form. These factors mean that relative to other cities, more ambitious and concrete pathways to decarbonisation may need to be found. The biggest challenges are around the consolidation of urban development, improving the coverage and sustainability of public transport, and decarbonising the region's oil sector.

**Villavicencio's population is growing rapidly but this has not been matched by densification.** The city's population increased by 36% between 2005 and 2018, but population growth has been accompanied by a significant increase in the built-up area footprint of the city.<sup>2</sup> Since 2000 Villavicencio has been sprawling faster than most other Latin American cities. This is one reason why transport emissions make up a larger proportion of total emissions in Villavicencio than in other cities (see below).

**In the next cycle, significant external support may be required in order to decarbonise Villavicencio's energy system.** In addition to hosting its own oil fields, Villavicencio is also the capital city of a wider region that contributes around 50% of Colombia's oil production.<sup>3</sup> The oil industry accounts for over 1/3 (38%) of the city's emissions.<sup>4</sup> More coordination and innovation is likely to be required, in order to build on the efforts of Colombia's leading producer and state-owned oil company, Ecopetrol. As part of the national goal to reduce emissions by 50% by 2030, this company, which operates Villavicencio's main oil fields (Apiay, Suria), is constructing a series of new of solar parks within the fields in the hope of reducing emissions by 20% over this same time period.<sup>5</sup>

**Villavicencio's transportation system requires significant retrofitting in order to accelerate the journey to net zero.** This sector currently contributes around 17% of Villavicencio's emissions, partly due to low levels of uptake.<sup>6</sup> A key City Government priority is the implementation of a new Mass Transport System designed to make public transport more efficient and integrate more seamlessly with an expanded network of bicycle lanes.

**More than in other cities, these elements mean that the path to net zero in Villavicencio is likely to be driven primarily by a few key sectors.** Although there are other challenges at play, the city will be unlikely to be able to make substantial progress until challenges relating to transport and energy mix are overcome. Other areas for progress in the next cycle include:

- **The transformation of the waste management system and the creation of a sewage treatment plant.** Waste and wastewater contribute around 2% of Villavicencio's emissions and there is no wastewater treatment plant.<sup>7</sup> Although today there are no concrete projects in place to confront these challenges, they have been envisioned in some policy tools as critical steps toward a sustainable future and solving them should provide opportunities for collaboration in the near future.

- **The management of protected areas in order to tackle deforestation and improve natural carbon sequestration.** Forest areas and wetlands located within the city are legally protected, but Villavicencio’s urban forestry and canopy coverage is still in the middle of the pack, suggesting that efforts to guarantee effective conservation can go even further in the next cycle.
- **The modernisation of Villavicencio’s building stock.** This is an example of an area where the current ambition of the city is limited even within the private sector. With the exception of Centro Empresarial Potenza, which is LEED certified, the adoption of sustainable practices in Villavicencio’s building construction sector is limited, and there are no real incentives for businesses to develop projects that comply with good environmental practices. This is therefore a key area where coordination and awareness raising will be required in the next cycle. An urban renewal project around the city’s Guatiquía River, recently promoted by the City Government, seems to be a promising platform to organise around and accelerate progress in this space.

**As one of Colombia’s main cattle farming hubs and as the main urban centre of the wider Orinoquia agro-industrial region, the city has potential as a platform for sustainable food production.** Orinoquia’s Territorial Plan to manage Climate Change prioritises the implementation of silvopastoral systems and the restoration and enhancement of grasslands for livestock in Villavicencio and other neighbouring local governments.<sup>8</sup> Cattle farming is one of the subsectors prioritised by Colombia’s NDC to reduce Agriculture, Forestry and Other Land Use (AFOLU) emissions, which currently account for ¼ of the total.<sup>9</sup> Sustainable cattle farming is also gaining prominence in local debates and decision making in both the public and private sector.

*Table 2: Villavicencio’s performance versus Latin American cities across key net zero endowment metrics*

		Villavicencio performance	Average among Latin American cities*	Latin American leader	Latin American laggard	Rank
Track record of compact urban development	Built-up area expansion rate, 2000-2015 <sup>10</sup>	+9%	+8%	+1.2% (Kingston)	+83.8% (Toluca de Lerdo)	51 <sup>st</sup> / 66
Urban forestry coverage and protection	Urban canopy coverage as share of metropolitan area <sup>11</sup>	21%	26%	82% (Santa Marta)	0% (Ciudad Juárez)	13 <sup>th</sup> / 23
	Change in urban canopy coverage as share of metropolitan area, 1992-2018 <sup>12</sup>	-0.1% (20.6% to 20.5%)	+0.4%	+7.9% (Concepción)	-13.3% (Tijuana)	15 <sup>th</sup> / 22

\*Among all measured cities in Latin and Central America and the Caribbean.

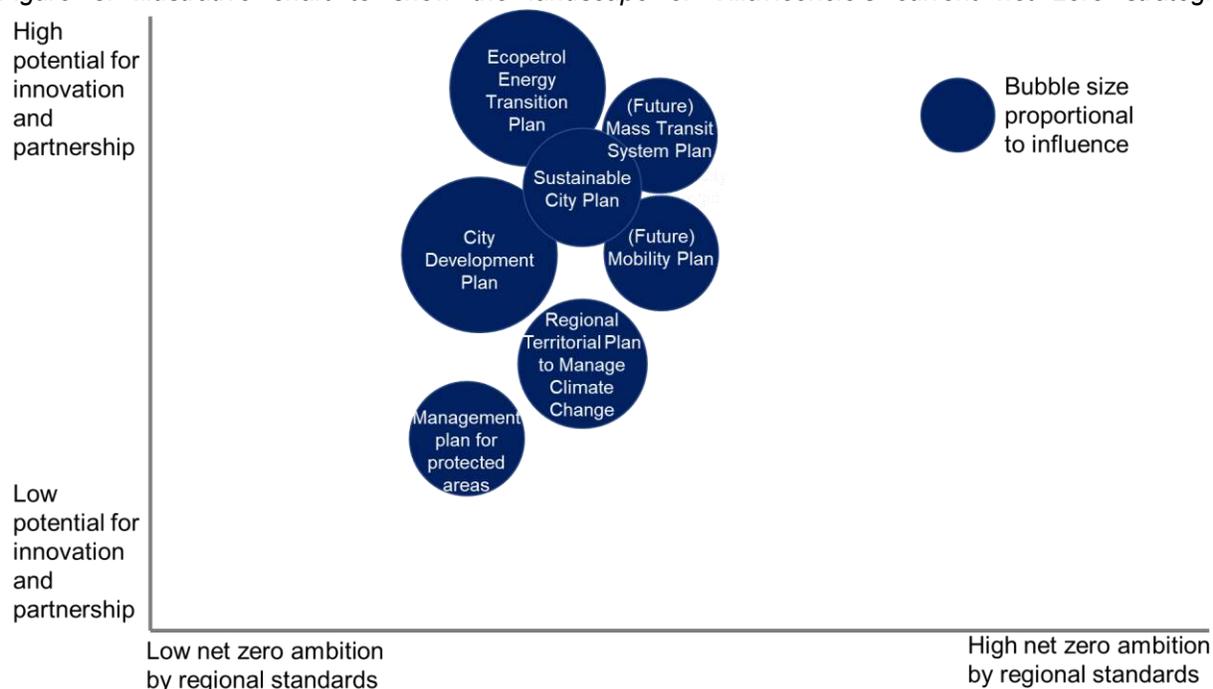
*Table 3: Villavicencio’s performance versus Colombian cities across key net zero endowment metrics<sup>13</sup>*

		Rank among Colombian cities
Transport systems efficiency	UN Habitat Urban Connectivity Index <sup>14</sup>	9 <sup>th</sup> / 18
	Per capita uptake of public transport	18 <sup>th</sup> / 32
Waste, water and electricity systems coverage	Sewer coverage	28 <sup>th</sup> / 32
	Electricity coverage	15 <sup>th</sup> / 32

All ranks apart from all-round mobility systems efficiency from University of Rosario Colombia City Competitiveness Index.

## Ambition and strategy to become net zero: where might innovation and co-ordination be required?

Figure 3: Illustrative chart to show the landscape of Villavicencio's current net zero strategies



\*Based on review of strategy content, comparative objectives, presence of innovation initiatives, and scope for partner delivery.

**As in many other Colombian and Latin American peer cities, Villavicencio does not yet have a fully customised local plan to mitigate climate change.** However, in contrast to other cities, Villavicencio does benefit from a broader regional plan (The Orinoquia's Territorial Plan to Manage Climate Change) and is part of one of the few regions (Meta) to have declared a climate emergency.

The city of Villavicencio also discloses environmental and emissions data to CDP, a global not-for-profit charity running the world's biggest environmental disclosure system for investors, companies, cities, states and regions to better manage their environmental impacts. This is an important step in ensuring oversight and accountability for targets that are set, but more progress is possible in the next cycle. Villavicencio does not yet have a city-wide system for measuring carbon footprints and synthesising environmental data, which may help to develop the transparency and standardisation necessary to convene and accelerate progress.

Other diverse policy tools, such as Villavicencio's Development Plan 2020 – 2023, Ecopetrol's Energy Transition Plan, The Orinoquia's Territorial Plan to Manage Climate Change and Villavicencio's Sustainable City Plan reveal the city's critical decarbonisation priorities and challenges.<sup>15</sup> These include:

- The implementation of new silvopastoral systems to foster low carbon agriculture.<sup>16</sup>
- Restoration and enhancement of grassland for cattle farming.<sup>17</sup>
- A 50%+ expansion of bicycle lane coverage between 2021 and 2023 (from 32km to 52km).<sup>18</sup>
- The planning and implementation of a new Mass Transport System with multiple mobility options and supported by a new integrated technology system designed to enhance efficiency and control with regards to route management.
- A new 51-acre protected urban park (Alma Viva Park) through a USD5.4million investment (1<sup>st</sup> phase).<sup>19</sup>

- The introduction of solar parks to decarbonise the oil sector.<sup>20</sup>
- Urban renewal.
- Modernising streetlighting to improve energy efficiency.

**Alongside a wider track record of UK engagement and partnership with Colombia, Villavicencio benefits from several existing links with international networks, partnerships and institutions that can be built on in the next cycle, including with the UK.** For example:

- **The Inter-American Development Bank** supported in 2016 the creation of Villavicencio's Sustainable City Action Plan and is financing the development of the city's mass transport system.
- **The National Development Bank Findeter** supported the creation of Villavicencio's Sustainable City Action Plan and is coordinating the planning of Villavicencio's Mass Transport System.<sup>21</sup>

# What is Villavicencio’s span of powers and influence to shift to net zero?

Table 4: Villavicencio’s performance across key metrics relating to the city’s span of net zero powers

	Score relative to Latin America leader* (max = 1)	Rank among Latin American cities
Metropolitan-level governance coordination	0.72	10 <sup>th</sup> / 53
City-wide spending capability**	0.72	5 <sup>th</sup> / 43

\*Among all measured cities in Latin and Central America and the Caribbean. \*\*Relative to city size. Full details of the individual metrics comprising each indicator provided in Appendix.

Table 5: Villavicencio’s rank among Colombian cities across key metrics relating to the city’s span of powers<sup>22</sup>

	Rank among Colombian cities
Local fiscal autonomy	13 <sup>th</sup> / 32
Local budget collection capacity	24 <sup>th</sup> / 32
Municipal risk management index	12 <sup>th</sup> / 32

**The role of the oil industry and the AFOLU sector means that businesses and the private sector are crucial to Villavicencio’s journey to decarbonisation.** Among these businesses, Ecopetrol, Colombia’s state-owned oil company, its logistics subsidiary, Cenit, and its biofuel unit, Bioenergy, will be important potential partners for fostering the energy transition of oil camps in Villavicencio and The Orinoquia. In the AFOLU sector, Colombia’s Cattle Farming Federation FEDEGAN and Meta’s Cattle Farming Committee have influence to promote the adoption of sustainable practices among producers, although a proliferation of small to medium sized producers and fragmentation of ownership, together with a lack of resources, may make transformation challenging.

**The Regional Environmental Authority, Cormacarena, can be a strategic ally to underpin climate action and encourage the transformation of economic activities to reduce emissions.** Cormacarena leads the implementation of environmental regulation in Villavicencio, affecting both private and public activities, and manages multiple protected areas in the city.

**Villavicencio’s City Government will play an important agenda setting role in transforming transport, streetlighting and waste management systems, but progress is likely to be highly reliant on the ambition and actions of the private sector.** On one hand, Villavicencio enjoys higher levels of spending capability and fiscal autonomy compared to other Colombian cities, which means ability to procure overseas services and agility to respond to shocks and crises is higher. Meanwhile as a medium-sized city whose core city is large enough to shape metropolitan outcomes, Villavicencio’s governance system has lower levels of fragmentation and higher potential for city-wide regulations. The city’s current strategy also revolves around the creation of municipal companies to lead projects in partnership with international partners.

**Businesses are responsible for managing many key systems and assets.** Private association Unirutas which is currently operating public buses in the city will be a key partner in the electrification of transport in the city. Similarly, in order to modernise the system of waste management and reduce emissions in this sector, the private operator of Villavicencio’s landfill, Bioagricola del Llano will be key agent. On the water front, the major stakeholder of the sector is Villavicencio’s Water and Sewerage Company EAAV, a state-owned utility.

The following table summarises Villavicencio’s span of powers and influences to accelerate to net zero in different sectors.

CP: Current Performance (1 = poor, 2 = limited, 3 = modest, 4 = promising, 5 = good)

AI: Ability to influence (1 = low, 2 = limited, 3 = moderate, 4 = higher, 5 = very high)\*

	CP	AI	Key notes	Key local stakeholders**	Current and potential UK contributions
<b>Transport</b>	2	3	<p>Implementation of a Mass Transport System to integrate planning and control of local bus services is a key opportunity.</p> <p>UK Prosperity Fund and Findeter are exploring alternatives to procure the feasibility studies of the city's new public transport system.<sup>23</sup></p> <p>A New Mobility Master Plan is underway.</p> <p>Private providers of public transport services (within Unirutas coalition) may be barriers to reform.</p> <p>Colombia's freight sector is already in transition.<sup>24</sup></p>	<p>Unirutas (private association of bus companies)</p> <p>Findeter</p> <p>ESMA</p> <p>Natural Gas Companies</p> <p>Electric utilities</p> <p>Logistics firms</p> <p>Service Stations Companies</p>	<p>Urban services firms-led expertise in master planning for New Mobility Master Plan</p> <p>SME-provided digital software and IoT to optimise control and integration of mass transport system</p> <p>EV hardware and software for mass transport system</p> <p>SME provided on-board technology and battery storage to increase distance using less battery power</p>
<b>Energy</b>	1	3	<p>Ecopetrol, operator of two oil fields in Villavicencio, has committed to reduce 20% of its emissions by 2030, by constructing solar parks to support its oil-field operations.<sup>25</sup></p> <p>City Government created a technology services company to manage and modernise streetlighting and implement smart city solutions.<sup>26</sup></p>	<p>Ecopetrol</p> <p>Cenit</p> <p>Alborada</p>	<p>SME and energy provider-led solar design to increase efficiency of solar cells</p>
<b>Building</b>	2	2	<p>Limited trials in constructing green buildings and improving energy efficiency of the built environment.</p> <p>Developers and business centres (e.g. Potenza) are pursuing international certifications on sustainable buildings.</p> <p>Large scale urban renewal schemes provide an opportunity to modernise building stock.</p>	<p>Colombian Chamber of Construction – Meta's Office</p> <p>Piedemonte Urban Development Company</p>	<p>Expertise on meeting international sustainable certifications</p> <p>Building Information Modelling (BIM) software and digital twin technology for new cycle of green buildings</p> <p>IoT technology to monitor energy usage of buildings</p>
<b>Waste</b>	2	1	<p>Sustainable City Plan prioritises waste management emissions potential, due to very low recycling (0.12%) and composting rates (0.17%).<sup>27</sup></p> <p>Landfill (around 500 tons a day) is operated by private company Bioagricola del Llano.<sup>28</sup></p> <p>The long useful life (&gt;20 years) of the landfill may discourage transformative investments and actions.</p>	<p>Bioagricola del Llano</p> <p>Cormacarena</p>	<p>Urban services firms-led management plans to help reduce the use of plastics and improve the Waste and Resources Action Program</p>
<b>Land use</b>	1	2	<p>Management of cattle farming hub and agro-industrial roles is limited, although part of national sustainability priorities.</p> <p>UK Government through its International Climate Fund has supported the adoption of sustainable practices in cattle farming in Colombia through an investment of USD 19million.<sup>29</sup></p> <p>Challenge to convene a fragmented sector composed of traditional small and medium producers.</p> <p>The effective management of protected areas is a pressing challenge. National initiatives encourage prioritising biodiversity in urban development.<sup>30</sup></p>	<p>FEDEGAN</p> <p>Meta's Cattle Farming Committee and Meta's Sustainable Cattle Farming Committee</p> <p>Cormacarena</p>	<p>AI, drones and data analytics for nature-based solutions</p> <p>Data software to monitor carbon foot prints</p>
<b>Sewage</b>	3	2	<p>Development of a sewage treatment plant is a key priority.</p>	<p>EAAV</p>	<p>BIM to design the new sewage treatment plant</p>

\*Based on insights from desk research and interviews. \*\*In addition to the City Government.

## What are the platforms and projects to catalyse net zero? Who are the potential investment and innovation partners?

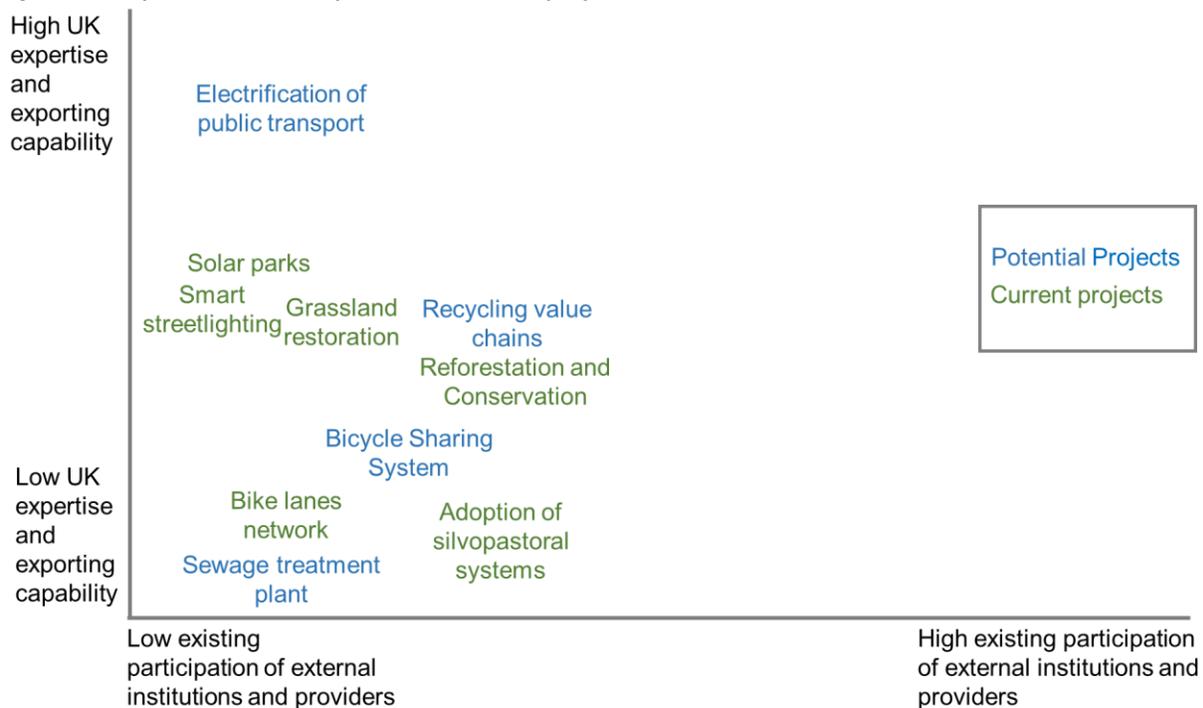
The next decade may prove essential to Villavicencio’s path to decarbonisation. The transport, AFOLU and oil sectors are the largest generators of emissions and will be the greatest contributors to change.

Projects in the AFOLU sector can be driven by business, while projects relating to the transport sector are likely to be influenced and accelerated by public institutions. In the oil sector, Ecopetrol, a state-owned enterprise, will be a critical ally for advancing the energy transition in the region.

**Overall, Villavicencio seems to be an example of a city where there are more potentially transformational projects currently underway, but fewer potential pathways to entry for external organisations.** Current observable projects are on average larger than in other Chilean and Colombian cities, but in general there are fewer examples of projects that are overseen or supported by entities other than local public sector organisations or businesses.<sup>31</sup> This suggests that in the next cycle, finding ways to support more diffuse models of project leadership may be important to accelerating progress.

Each of the projects mapped on page 11 have different levels of participation among external institutions and providers, and different levels of suitability for UK expertise and exporting capability (see also diagram below).

Figure 4: Map of current and potential net zero projects in Villavicencio



**Villavicencio does not yet have an independent civic leadership organisation to provide an external whole-city approach to decarbonisation.** In general, the city also seems to have fewer, less visible platforms to support the journey to net zero, which also seem to be less active in sectors related to decarbonisation than in other cities.<sup>32</sup> This implies that in the next cycle, efforts to convene and mobilise the innovation ecosystem around decarbonisation will be important for accelerating progress.

**Potential platforms that may support Villavicencio's journey to net zero include:**

- **Santo Tomas University Villavicencio**, a leading private University in the region with a programme on environmental engineering and the potential to become a platform to promote the public conversation about decarbonisation.
- **De Los Llanos University**, the main public University of The Orinoquia Region, and a highly influential institution in Villavicencio. The University has programmes on agriculture, agroindustry and environmental engineering.
- **Meta's Business Committee**, which convenes and represents the private professional, commercial and industrial associations of Villavicencio in regard to public affairs.
- **Villavicencio's Chamber of Commerce**, one of the main platforms for articulating the actions of the private sector in the city.
- **Fedegan**, the main national organisation representing cattle farmers, which can influence policies and projects affecting this economic sector.
- **Ecopetrol**, a state-owned but privately run firm that has the power and flexibility to effectively accelerate the energy transition of its operations. Any energy transition may also trigger similar processes in other industries, building up in the local expertise developed around Ecopetrol's investments.

PROJECTS TO CATALYSE net zero	Size	Timeframe	POTENTIAL INVESTMENT AND INNOVATION PARTNERS
<b>LAND USE</b>			
<b>Silvopastoral systems, grassland restoration, and sustainable farming solutions.</b> <sup>33</sup> Colombia's government is supporting the adoption of sustainable practices via technical advisory, research and loans. Cormacarena is developing rotational livestock grazing systems. New World Bank and UK government supported project to catalyse partnerships between government and private sector in Orinoquia to scale sustainable farming practices, reward sustainability through payments for reducing emissions, and introduce profitable livelihood alternatives to illicit production. <sup>34</sup>	Medium	Ongoing	FEDEGAN Ministry of Agriculture and Rural Development Colombia's Corporation of Agricultural Research AGROSAVIA (Liberty Research Centre, Villavicencio) Colombia's Agriculture Institute ICA Colombia's Agricultural Financial Fund FINAGRO Colombia's Agricultural Bank Banco AGRARIO Natural National Parks of Colombia World Bank UK government (BEIS and DEFRA) Colombian Institute of Hydrology, Meteorology and Environmental Studies
<b>Alma Viva Park construction</b> New 21 hectare urban park as part of USD 5.4million investment (1 <sup>st</sup> phase), beginning September 2021.	Small	Short-term	Villavicencio's City Government
<b>Urban renewal project.</b> Sustainable urbanisation around Guatiquía River 20,000 housing units	Large	Long-term	Villavicencio's City Government Piedemonte Urban Development Company
<b>Management of other protected areas</b> The Meta Verde Campaign is reforesting 10 million trees from 2020-2023.	Small size	Ongoing	Villavicencio's City Government Cormacarena
<b>ENERGY</b>			
<b>San Fernando solar farm</b> 59MwP, 46ha. <sup>35</sup>	Large	Ongoing	Ecopetrol Cenit
<b>New Bioenergy Plant</b> at El Alcavaran. <sup>36</sup>	Large	Ongoing	Ecopetrol Mitsubishi
<b>LED Streetlighting</b> Replacing 45,000 lights with LED lamps. <sup>37</sup>	Medium	Ongoing	Villavicencio's City Government Alborada
<b>ACTIVE TRANSPORT AND MOBILITY</b>			
<b>Bike lanes expansion.</b> Expansion from 32km to 52 km by 2023. <sup>38</sup>	Medium	Ongoing	Villavicencio's City Government
<b>Design and implementation of new public transport system.</b> <sup>39</sup>	Large	Mid-term/long-term	Villavicencio's City Government Ministry of Transport
<b>TRANSPORT ELECTRIFICATION</b>			
<b>Electric Buses (Villavicencio's future Mass Transport System.)</b> <sup>40</sup>	Medium	Mid-term/long-term	Villavicencio's City Government Ministry of Transport EMSA
<b>SEWAGE TREATMENT</b>			
<b>Sewage treatment plant.</b> <sup>41</sup>	Large	Long-term	EAAV Villavicencio's City Government Ministry of Housing, City and Territory
<b>WASTE</b>			
<b>Recycling value chains.</b> <sup>42</sup>	Small size	Long-term	Villavicencio's City Government
<b>Composting.</b> <sup>43</sup>	Small size	Long-term	Bioagricola del Llano

Project Size: Small: <USD 10million, Medium: USD 10 – 50million, Large: >USD 50million. Project time frame: Short: 1 – 2 years, Medium: 2 – 5 years, Long: > 5 years

## Appendix

### Net Zero Typology – Terms and Criteria

Assets		
	Impaired	Strongly negative score (<-20%) or limited evidence of efforts to diversify/improve systems
	Challenger	Negative score for assets, but evidence of efforts to diversify economy and invest in underlying systems
	Reformist	Marginal score for assets, no other defining features
	Guardian	Marginal score for assets, presence of natural assets is defining feature
	Equipped	Positive score, evidence of leadership on one of the agendas (e.g. public transport/density etc.)
Ambitions		
	Constrained	Negative score for ambition and strategy, limited ambition of public sector ambition plus limited evidence of role of civic leaders, platforms and others in supporting ambitions
	Championed	Negative score for ambition and strategy, but strong evidence of role of civic leaders, platforms and others in supporting ambitions
	Cautious	Negative score for ambition and strategy, but some evidence of emerging public sector ambition.
	Enthusiast	-15% to +15% for ambition and strategy, plus evidence of willingness to accelerate in next cycle.
	Trailblazer	Highly positive score for ambition and strategy.
Powers		
	Reliant	Marginal score overall, plus evidence of strength in integration measures but majority of projects/systems overseen by private sector actors
	Opportunist	Positive score for powers and influence, evidence of civic leadership and/or non-gov platforms to build on
	Functional	Negative score for powers and influence, no real signs of strength for governance integration or financial/fiscal powers
	Change-maker	Positive score for powers and influence, not as strong for governance integration (outside top 25%) but strong for financial/fiscal powers
	Commander	Positive score for powers and influence, top 25% for governance integration
Projects		
	Steady	More projects in pipeline than underway, strongly negative score (e.g. -20% or lower) for projects and platforms.
	Standby	Moderately negative score for projects and platforms (-10 to -20%), platforms stronger than projects.
	Accelerator	More projects in pipeline than currently underway, signs of acceleration, marginal score (-5% to +5%) for projects and platforms.
	Purposeful	Positive score (+5% to +15%) for projects and platforms, without transformational scale or impact.
	Pathfinder	Very positive score (>25% or higher) for projects + platforms, demonstrative of pace of change and appetite to deliver.
Innovation		
	Unsigned	Strongly negative score for innovation and investment, limited and sporadic observable relationships with MNDBs or other partners and platforms.
	Cushioned	Strongly negative score for innovation and investment, yet some evidence of observable relationships with capital suppliers and other civic or business enablers to fall back on.
	Experimenter	Marginal score for innovation and investment, with strong evidence of leverageable relationships with big capital and other actors and appetite to pilot & demonstrate.
	Invested	Positive score. Stronger evidence of multi-sector leadership, more established track record of scaling pilots.
	Pioneer	Strongly positive score. Established track record of scaling city-wide projects, supportive universities, dynamic green innovation ecosystem.

The list of indicators for summary Spidergram (**indicators in red are national datasets**) is provided below. NOTE: not all cities are included in all indicators. Final scores are calculated according to an aggregate of each city's position across all measures, using an Elo algorithm. The Business of Cities' Elo algorithm computes the overall performance of each city relative to all other cities on aggregate across multiple benchmarks and datasets. The Elo algorithm rates cities or regions by comparing their performance in every possible permutation against a list of other cities/regions. The system produces the most accurate comparative assessment of city/region performance, as it accounts for the fact that some cities/regions appear in more benchmarks and datasets than do others, and that each dataset measures a different number of cities.

## Systems and Assets

### Track record of compact development

- Core urban area population density (Demographia)
- Built-up area expansion rate, 2000-2015 (OECD)
- Per capita built-up area expansion rate, 2000-2015 (OECD)
- Weighted population density (ITDP)

### Urban canopy coverage and protection

- Urban green coverage as share of metropolitan area (OECD)
- Change in urban green coverage as share of metropolitan area, 1992-2018 (OECD)

### Transport and infrastructure systems efficiency

- % of population living within 500m of frequent public transport service (ITDP)
- % of population living within walking distance of healthcare and education services (ITDP)
- % of population living within 500m of a car-free zone (ITDP)
- Per capita length of high-capacity public transport: BRT, light rail/tram and metro/subway (multiple sources)
- Aggregate score across all publicly available global benchmarks of public transport systems performance (multiple sources)
- Size of electric vehicle fleet (C40)
- Sustainable modal share (C40)
- Per capita public transport uptake (University of Rosario)
- Sewer coverage (University of Rosario)
- Electric power coverage (University of Rosario)
- UN Habitat Colombian Urban Connectivity Index

## Span of Powers and Influence

- No. of municipalities per 100,000 people in the metropolitan area (OECD)
- Size of core city vs. metropolitan area (multiple sources)
- Extent of metropolitan level government coordination (multiple sources)
- City level spending capability: absolute capital budget of city government plus per capita capital budget (multiple sources)
- No. of modes of transport the main transport authority has authority over (multiple sources)
- % of modes of transport the main transport authority has authority over, relative to the number of modes of transport that exist within the city (multiple sources)
- Transport authority spending capability: absolute budget of main transport authority plus per capita budget (multiple sources)
- Level of fiscal autonomy (University of Rosario)
- Local budgetary collection capacity (University of Rosario)
- Municipal risk management index (University of Rosario)

## Innovation and Investment Environment

- No. and % of local tech-enabled firm HQs specialising in sectors directly allied to net zero (Crunchbase)
- No. and % of local tech-enabled firm HQs specialising in sectors indirectly allied to net zero (Crunchbase)
- Presence, extent and maturity of open data platform (multiple sources)
- Presence of universities capable of leading the charge on the urban SDGs (Times Higher Education Impact Rankings 2021):
  - Affordable and clean energy
  - Industry, innovation and infrastructure
  - Climate action
  - Sustainable production and consumption

## Ambition and Strategy

- Presence, scale and timespan of climate action plan (multiple sources)
- Presence and scale of climate emergency declaration (multiple sources)
- Scope of planned climate actions (multi sector vs. single sector) (multiple sources)
- Presence and timespan of city-level target for net zero (multiple sources)
- Implied carbon reduction momentum (multiple sources)
- Presence and maturity of standardised emissions reporting mechanism and carbon emissions disclosure practices (CDP)
- Consistency of current targets with Paris Agreement goals (C40)

## Projects and platforms

- Aggregate project size and status (according to size of investment and current status: plan/ambition, pilot, project, or city-wide scaled project)
- Average number of sources of leadership in decarbonisation projects in the city (city/regional government, national government, business, multi-national organisations, universities and civic groups)
- Number of pilot and demonstration projects with high potential to scale
- Presence of independent civic organisation for city and track record of thought leadership or activity on issues relating to decarbonisation
- Number and visibility of non-governmental platforms:
  - Visibility on social media websites
  - Visibility in global media sources
  - Number of mentions in relation to decarbonisation

## National level impetus and enablers

- Presence and timespan of national net zero ambition / target (World Economic Forum)
- Climate Change Performance Index score (New Climate Foundation)
- KPMG Climate Change Readiness Report 2019:
  - Enterprise capability
  - Government capability
  - Societal capability
- Presence, scope and timespan of national emissions reduction target (multiple sources)
- Implied carbon reduction momentum (multiple sources)
- National renewable energy share for electricity output (World Bank)
- National level CO2 emissions per capita (World Bank)
- National level GDP per capita (World Bank)

Indicators used to calculate metropolitan-level governance coordination score (p. 6): no. of municipalities per 100,000 people in the metropolitan area; size of core city vs. metropolitan area; extent of metropolitan-level government coordination

Indicators used to calculate city-wide spending capability score (p. 6): absolute capital budget of city government plus per capita capital budget

## References and endnotes

<sup>1</sup> Among the 520 cities included in the City Typology Index

<sup>2</sup> DANE (2005) 'Estimaciones de población 1985 - 2005 y proyecciones de población 2005 - 2020 total municipal por área'. Available at: [https://www.dane.gov.co/files/investigaciones/poblacion/proyepobla06\\_20/Municipal\\_area\\_1985-2020.xls](https://www.dane.gov.co/files/investigaciones/poblacion/proyepobla06_20/Municipal_area_1985-2020.xls); DANE (2018) 'Poblacion ajustada por cobertura'. Available at: <https://www.dane.gov.co/files/censo2018/informacion-tecnica/CNPV-2018-Poblacion-Ajustada-por-Cobertura.xls>; (OECD (2020) 'World Cities Tool'. OECD. Available at: <http://www.worldciestool.org/>

<sup>3</sup> The League Against Silence (2019) 'Meta and Oil.' Cerosetenta. Available at: <https://cerosetenta.uniandes.edu.co/meta-y-petroleo/>

<sup>4</sup> Findeter (2017) 'Sustainable Villavicencio Action Plan'. Findeter. Available at: [https://issuu.com/findetersa/docs/plan\\_de\\_acci\\_n\\_villavicencio](https://issuu.com/findetersa/docs/plan_de_acci_n_villavicencio)

<sup>5</sup> Government of Colombia (2020) 'Update of the Determined Contribution at the National Level of Colombia'. Government of Colombia. Available at: <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Colombia%20First/NDC%20actualizada%20de%20Colombia.pdf>; Ecopetrol (2021) 'Mitigation'. Ecopetrol. Available at: <https://www.ecopetrol.com.co/wps/portal/Home/es/ResponsabilidadEtiqueta/Medio%20ambiente/cambio-climatico-et>

<sup>6</sup> Findeter (2017) 'Sustainable Villavicencio Action Plan'. Findeter. Available at: [https://issuu.com/findetersa/docs/plan\\_de\\_acci\\_n\\_villavicencio](https://issuu.com/findetersa/docs/plan_de_acci_n_villavicencio)

<sup>7</sup> *Ibid.*

<sup>8</sup> CIAT, Cormacarena, Corporinoquia and ECOPETROL (2017) 'Plan Regional Integral de Cambio Climático para la Orinoquía.' Visión Regional. Available at: <https://www.cormacarena.gov.co/gestion-de-planificacion/nodo-regional-de-cambio-climatico-norecco/>

<sup>9</sup> Government of Colombia (2020) 'Update of the Determined Contribution at the National Level of Colombia'. Government of Colombia. Available at: <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Colombia%20First/NDC%20actualizada%20de%20Colombia.pdf>

<sup>10</sup> OECD (2020) 'World Cities Tool'. OECD. Available at: <http://www.worldciestool.org/>

<sup>11</sup> OECD (2020) 'Land Cover in Functional Urban Areas, percent of total area'. OECD. Available at: [https://stats.oecd.org/Index.aspx?DataSetCode=LAND\\_COVER\\_FUA](https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER_FUA)

<sup>12</sup> OECD (2020) 'Land Cover in Functional Urban Areas, percent of total area'. OECD. Available at: [https://stats.oecd.org/Index.aspx?DataSetCode=LAND\\_COVER\\_FUA](https://stats.oecd.org/Index.aspx?DataSetCode=LAND_COVER_FUA)

<sup>13</sup> Private Competitiveness Council (n.d.) 'Cities Competitiveness Index'. Private Competitiveness Council. Available at: <https://compite.com.co/indice-de-competitividad-de-ciudades/>

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<sup>16</sup> CIAT, Cormacarena, Corporinoquia and ECOPETROL (2017) 'Plan Regional Integral de Cambio Climático para la Orinoquía.' Visión Regional. Available at: <https://www.cormacarena.gov.co/gestion-de-planificacion/nodo-regional-de-cambio-climatico-norecco/>

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- <sup>25</sup> Ecopetrol (2021) 'Mitigation'. Ecopetrol. Available at: <https://www.ecopetrol.com.co/wps/portal/Home/es/ResponsabilidadEtiqueta/Medio%20ambiente/cambio-climatico-et>
- <sup>26</sup> Villavicencio Mayor's Office – Meta (2021) 'Business Administrator Alejandro Lacharme assumed functions as Alborada manager'. Villavicencio Mayor's Office – Meta. Available at: <http://webcache.googleusercontent.com/search?q=cache:Fe5An21sjwJ:www.villavicencio.gov.co/NuestraAlcaldia/SaladePrensa/Paginas/EL-ADMINISTRADOR-DE-EMPRESAS-ALEJANDRO-LACHARME-ASUMI%25C3%2593-FUNCIONES-COMO-GERENTE-DE-ALBORADA.aspx+&cd=1&hl=en&ct=clnk&gl=uk>
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- <sup>30</sup> Since 2019, the national government has promoted the Biodiversidades initiative, to encourage cities to prioritise biodiversity and its benefits and integrate this into urban development projects.
- <sup>31</sup> Based on aggregate number of different sources of leadership involved in identified decarbonisation projects in the city: city/regional government, national government, business, multi-national organisations, universities and civic groups.
- <sup>32</sup> Based on aggregate scores according to visibility on social media websites and in the global media, plus number of times the organisation is mentioned in relation to decarbonisation.
- <sup>33</sup> CIAT, Cormacarena, Corporinoquia and ECOPEPETROL (2017) 'Plan Regional Integral de Cambio Climático para la Orinoquia.' Visión Regional. Available at: <https://www.cormacarena.gov.co/gestion-de-planificacion/nodo-regional-de-cambio-climatico-norecco/>
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- <sup>35</sup> Will be Colombia's largest energy self-generation centre. 100,000+ solar panels will offset 410,000 tonnes of CO2 over 15 years ; Gente Palante (2020) 'They will build a new solar park in Meta with 100,000 panels'. Gente Palante. Available at: <https://www.gentepalante.com/2020/02/construiran-nuevo-parque-solar-en-el.html>
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- <sup>38</sup> *Ibid.*
- <sup>39</sup> Plans to prepare technical, legal and financial designs and phase one implementation by 2023. *Ibid.*

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<sup>40</sup> Maria Barragan (2020) 'Más de 2 mil millones de pesos donó el reino unido para el sistema estratégico de transporte público de villavicencio'. Villavicencio Día a Día. Available at: <https://www.villavicenciodiaadia.com/mas-de-2-mil-millones-de-pesos-dono-el-reino-unido-para-el-sistema-estrategico-de-transporte-publico-de-villavicencio/>

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<sup>43</sup> *Ibid.*