Climate & Development Knowledge Network

INSIDE STORIES on climate compatible development

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Key messages

- The capital cities of Bolivia, Ecuador and Peru are vulnerable to climate change, partly due to their dependence on water from retreating Andean glaciers for human consumption, industrial use, hydropower production, agriculture and other uses.
- Calculating city-wide carbon and water footprints has proven useful for decision-making in urban planning and management, and has resulted in action plans, policies and projects in the three cities.
- Strong high-level political will, 'champions' in municipal governments, innovative financing and an enabling institutional environment at the municipal level are critical for successful urban climate compatible development.
- Buy-in from identified key stakeholders representing different city sectors (transport, residential, commercial, industrial and public) has been important to building momentum for climate compatible development.
- Measuring carbon and water footprints and subsequent planning efforts can stall if no further steps are taken to move to a project implementation phase. Local governments are already working to identify the best ways to create partnerships with key actors, gain access to financing and technology, and institutionalise footprint-related processes in their operations.

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Assessing carbon and water footprints in Andean cities: Comparative study of La Paz, Quito and Lima

The first phase of the project 'Carbon and water footprinting in three Andean Cities: La Paz, Quito, Lima' (the Cities Footprint Project)[1] was co-sponsored by the Climate and Development Knowledge Network (CDKN) and the Development Bank of Latin America (CAF), facilitated by Fundación Futuro Latinoamericano and implemented by the Bolivian consultancy Servicios Ambientales. Once the footprints of the three cities and their municipal governments were assessed during the project, the municipalities prepared action plans and pilot projects to tackle the most critical issues. This comparative Inside Story illustrates the challenges, enabling factors, lessons learned and implications for climate compatible development derived from the implementation of the Cities Footprint Project, emphasising the common aspects and main differences of the experience in these Andean cities. The project continues into a second phase.

The main objective of the Cities Footprint Project is to complement and support municipal initiatives related to climate change mitigation and adaptation, through the assessment of the carbon and water footprints of municipal governments and cities. The results are then used to promote greenhouse gas emission reduction and water management actions, ultimately aiming for a transition to urban climate compatible development in these cities, which can then become models for other urban centres.

The project arose in 2012 in response to demand from the three mayors, who all demonstrated a strong interest in climate compatible development. The three cities were selected to participate in the project as they are vulnerable to climate change in terms of water availability, mainly due to the retreat of Andean glaciers and variability in rain patterns. At the same time, there are clear opportunities to promote low-carbon development.

CDKN has a growing portfolio of work in states, provinces, cities and districts. It is committed to capturing the lessons learned, and to better understanding what makes low-carbon and climate-resilient development efforts work well at the subnational level. CDKN and ICLEI – Local Governments for Sustainability have set up a joint learning programme to distil and share these lessons with others. This *Inside Story* is one output of the learning programme. For more in the series, visit www.cdkn.org/cdkn_series/inside-story

Three distinctly climate-vulnerable cities

La Paz, the administrative capital of Bolivia, is the third most populous city in the country, with approximately 840,000[2] inhabitants, and an annual population growth rate of about 1% in the last 10 years.[3] Situated at an average 3,600 meters above sea level, it nests in a crater in the middle of the Andean high plateau (*altiplano*). Although only 9% of the city's area is categorised as urban, 99% of its population is concentrated there.[4] Due to its dependence on water from retreating glaciers – up to 25% of water used in La Paz is currently sourced from glaciers, and 48% of the total glacier mass from the Cordillera Real has been lost in the last 50 years[5] – La Paz is considered highly vulnerable to the effects of climate change.

Sitting at 2,800 meters above sea level, Ecuador's capital, the Metropolitan District of Quito (DMQ), is the second largest city in the country, home to approximately 2.3 million inhabitants (up from 1.4 million in 1990).[6] The urban area, covering only 8% of the total area, holds about 70% of the total population. Although not densely populated, the city's large rural area has a considerable population in absolute terms (more than 600,000 inhabitants) and this has implications for the carbon and water budgets of the DMQ. Water provision depends partially on retreating Andean glaciers, making Quito a vulnerable city and a perfect candidate for the Cities Footprint Project.

Lima is the capital of Peru, situated on the coast of the Pacific Ocean, by the coastal desert and at the western slope of the central Andes of Peru. Metropolitan Lima is the most populous urban area in the country, with 8.4 million inhabitants – about one third of the nation's total population – and constitutes the fifth largest city in Latin America.[7] Lima is also the hub of economic activity of the country, including 57% of industry, 62% of commerce, 46% of the economically active population and 53% of total GDP.[8] Although a coastal city, Lima has practically no rain and depends on three rivers that are sourced in part by retreating Andean glaciers for water.

The municipal governments of the three cities share a proactive attitude towards climate compatible development. All have a considerable number of climate change policies, plans, programmes and projects, most focused on adaptation but some on mitigation. Although it is not always explicitly acknowledged by the municipal governments, climate change is being increasingly mainstreamed into the cities' development planning.

Before the Cities Footprint Project, Quito was the only city among the three with a greenhouse gas inventory, elaborated with an adjusted methodology for country-level assessment every four years starting in 2003. La Paz and Lima had not assessed their inventories, and none of the cities had reported them. As a result of their participation in the project, they became part of a leading group of cities invited to pilot-test the city-level methodology developed by the World Resources Institute, C40 Cities Climate Leadership Group and ICLEI – Local Governments for Sustainability (ICLEI-WRI-C40) for this purpose.

Assessing the three cities' footprints

The annual carbon and water footprints of the three cities were assessed using internationally-recognised methodologies, the Global Protocol for Community-Scale Greenhouse Gas Emissions (GPC)[9] and the Water Footprint Assessment Manual[10], with the technical support of Carbonfeel[11] and the Water Footprint Network, creators of the concept of the water footprint. This was the first effort to measure the water footprint of a city (water footprints of products, countries and even continents' have been assessed previously). It was the first greenhouse gas inventory study conducted for La Paz and Lima. Although it was the fourth such study for Quito, it was the first with a methodology customised for a city-level analysis.

As nearly the entire populations of La Paz and Lima are concentrated in their urban areas, the geographical scope of the assessment for these two cities was limited to these areas. However, as about a quarter of total population in Quito inhabits the rural area of the territory, the assessment included the rural area and the results must be evaluated with this in mind.

City-level assessment

The findings of the city-level carbon and water footprint assessments are presented in the graphic overleaf.

Carbon footprint

The sector contributing the most to the city-wide carbon footprint across all cities is transport, with gasoline and diesel as the main greenhouse gas emission sources.

Quito, Ecuador.

Overall, the carbon footprint data were considered very relevant for decision-making in the three cities, as there was previously no such information for La Paz and Lima, and in Quito the data completed a set of measurements. All three cities have major plans and current investments in the transport sector, so the results obtained actually validate their interventions from an environmental standpoint, complementing the goals of improved urban mobility and better quality of life for citizens. The same applies for the residential and solid waste sectors, where the three cities also are investing efforts, and this information helps to make the climate change dimension visible in these areas.

With the above-mentioned caveat regarding comparisons between the cities, in absolute terms the carbon footprint of Lima is about 3 times larger than that of Quito, at 15 million versus 5 million tons of CO_2 equivalent (tCO_2eq), respectively. Lima's footprint is roughly 10 times larger than that of La Paz (1.5 million tCO_2eq). However, when population is factored in, the per capita carbon footprint in Quito is about 50% larger than the per capita carbon footprint of La Paz and Lima.

The assessment of the carbon footprint allows the cities to comply with international commitments, such as reporting their greenhouse gas inventories to the Carbon Climate Registry under the Mexico City Pact. It has also encouraged the participation of La Paz and Lima in a group of 35 cities from around the world in a pilot project to test GPC v1.0, led by ICLEI-WRI-C40. This translates into increased international visibility for the cities and recognition of their proactive attitude towards climate change issues.

Water footprint

The water footprint of the three cities is attributed primarily to the residential sector, with marginal contributions by the commercial, industrial and public sectors. The dominance of the grey water footprint, which comprises more than 95% of the total water footprint in all cities, emphasises the need to treat waste water. As of 2012, Lima treated only 10% of its total waste water and it was not treated at all in La Paz and Quito.

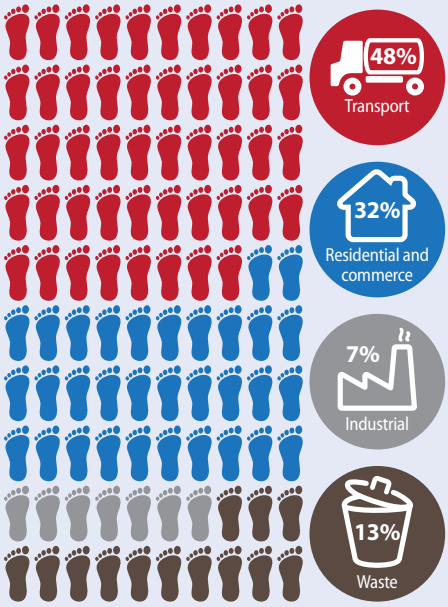
A sustainability analysis was conducted, where the water footprint of the three cities was compared to the availability of fresh water resources. In all cities, the ecosystems are unable to withstand the pressure generated by the cities' use of water, especially untreated waste water.

One shortcoming in Lima was the lack of complete data to assess the industrial sector's contribution, which is believed to be larger than revealed in the analysis. It is also important to note that, according to the methodology described in the Water Footprint Assessment Manual,[12] local water standards need to be factored in to calculate the water footprint. In Peru, the water regulations regarding quality of discharges to water bodies are twice as stringent as those in Bolivia and Ecuador, and this has the result of amplifying Lima's water footprint in the analysis.

In absolute terms, the water footprint of Lima is about six times larger than that of Quito (6.3 billion versus 1 billion m^3) and about 30 times larger than the water footprint of La Paz (0.2 billion m^3). A per capita analysis shows the same trend: the water footprint of one person in Lima is still larger than that of a person in Quito (30% more) and of one person in La Paz (about 60% more). However, as mentioned, the regulations for water quality in Lima are higher, and if the water footprint had been calculated with the same values as for the other cities, it is likely that the per capita water footprint would be lower –although in absolute terms it would likely still be the highest.

La Paz

Contributors to carbon footprint*



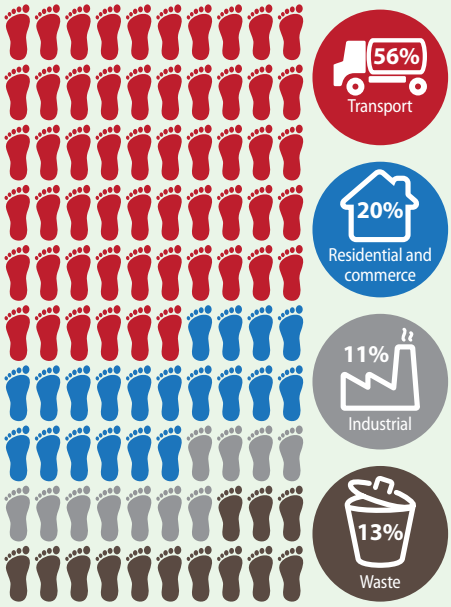
Actual emissions and per capita emissions

Total carbon emissions: **1.5mt**

Population: **840,000**

Carbon emissions per capita: **1.8t**

Quito

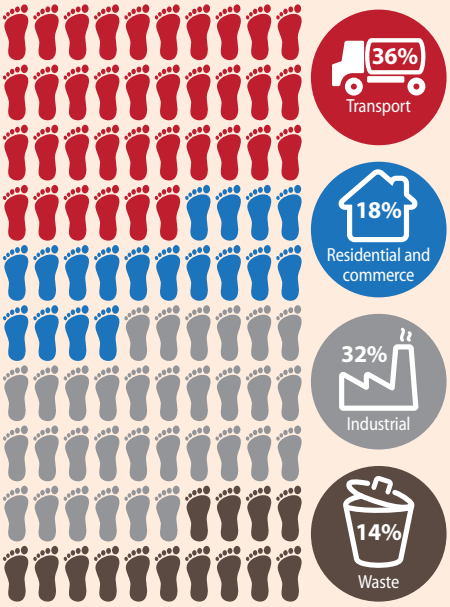


Total carbon emissions: **5mt**

Population: **2,300,000**

Carbon emissions per capita: **2.4t**

Lima



Total carbon emissions: **15mt**

Population: **8,400,000**

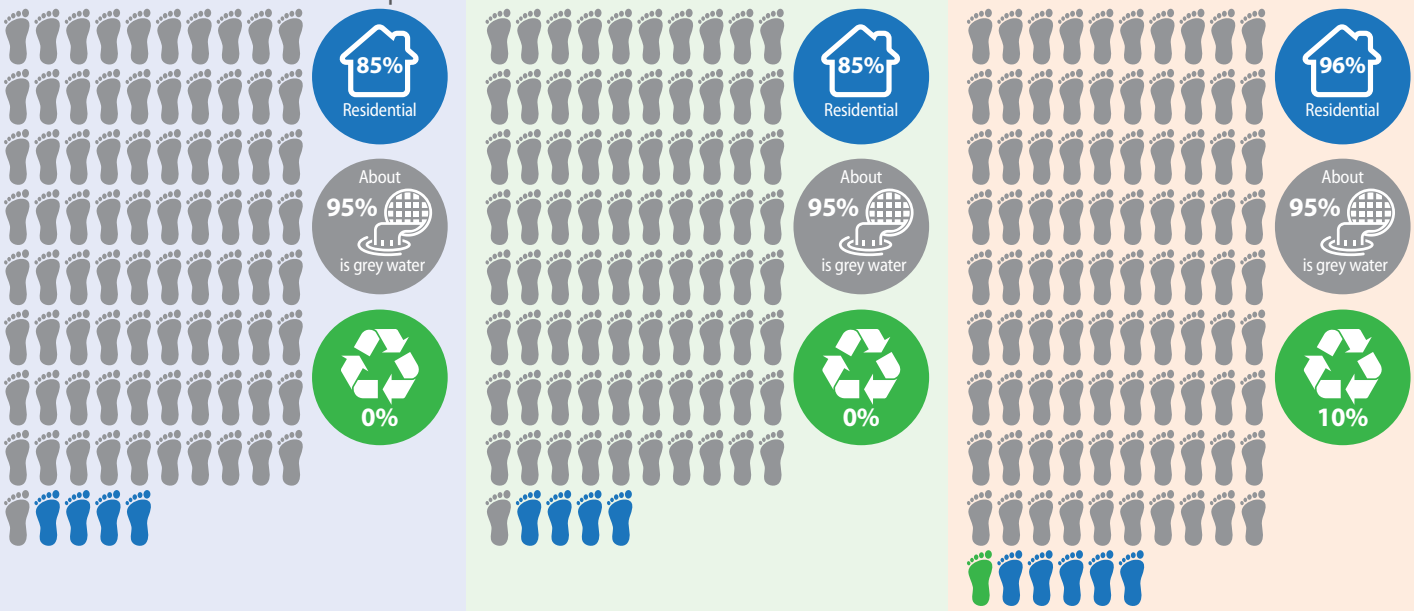
Carbon emissions per capita: **1.4t**

* Base year: La Paz and Lima, 2012; Quito, 2011.

La Paz | Quito | Lima

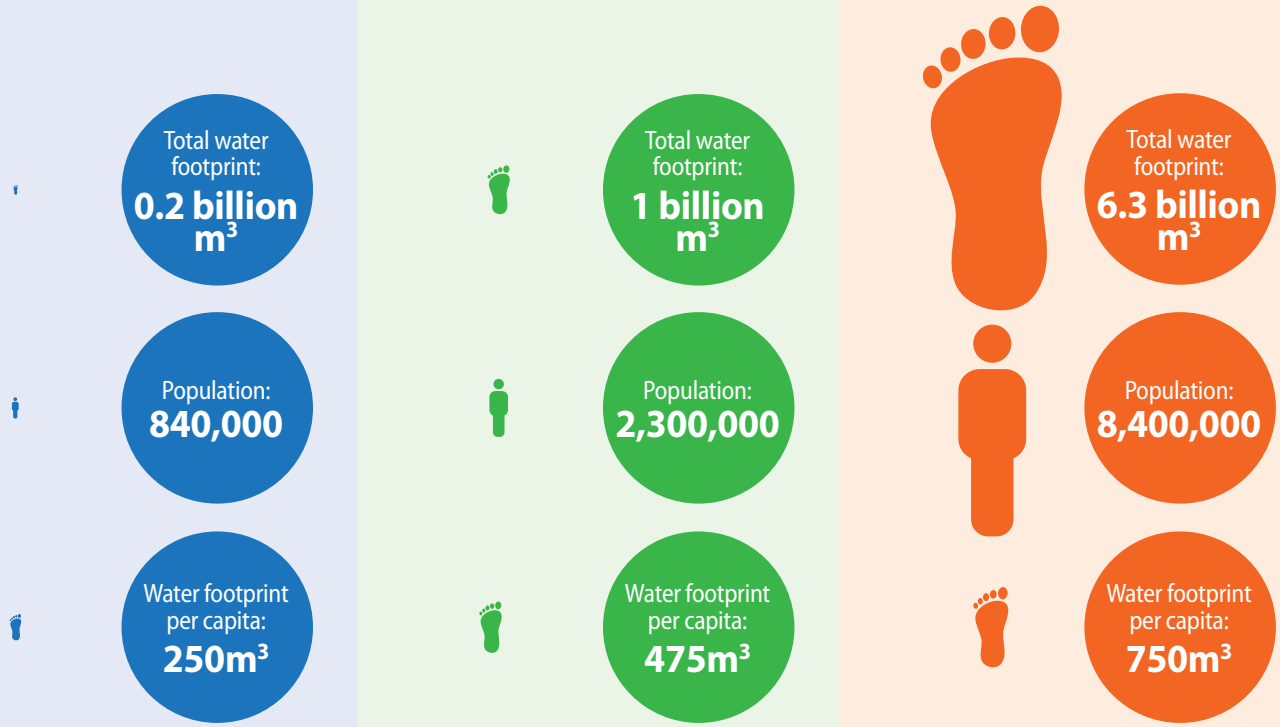
Water footprint

The main contribution to water footprint in all 3 cities is residential use …



… with small contributions from the commercial, industrial and public sectors.

Actual usage and per capita usage



Lima, Peru.

Achievements of the pilot projects

Based on the diagnosis of carbon and water footprints, small-scale pilot projects to demonstrate footprint reduction were put into place. The objective was to prove that it is possible to gradually reduce the carbon and water footprints of the cities, even with limited resources, through interventions that have can be replicated elsewhere. Criteria for the selection of the pilot projects included: their potential to leverage additional funds for scaling-up, showing innovation, and alignment with current local and national policies.

In La Paz and Quito, the pilot projects were found to be successful in terms of having an interesting replication potential, and they could become sustainable initiatives that can tangibly reduce both the carbon and the water footprints in these cities. In Lima, the municipal government did not allocate the same level of priority to the pilot projects, and thus they did not receive the necessary support during design and implementation; however they did still have a modest impact. Box 1 summarises some of the pilot projects in each city.

Developing action plans

Based on the footprint assessments, each city prepared action plans comprising a project portfolio divided into sectors; projections of footprints onto short-, medium- and long-term planning horizons defined by municipal development plans; a cost–benefit and cost-effectiveness analysis of each individual footprint-reducing project in the portfolio; and identification of financial sources and technology providers to provide a basis for the design and implementation of projects.

The city-wide carbon and water footprints were projected into the future using official data about population growth, GDP growth and other variables. The result was a business-as-usual growth scenario. Subsequently, a smart-growth scenario was constructed. Current city plans and projects were evaluated in terms of their potential to reduce carbon and water footprints in the long term. For instance, as transport reforms are considered a high priority for each city, the project evaluated related projects, such as the implementation of Bus Rapid Transit systems; the ongoing construction of metro lines, electric trains and trams, cycling routes and pedestrian-only areas; modernisation of the automobile fleet; and vehicle import norms. Additionally, projects not currently envisioned by the administration were included in the analysis for consideration by the municipal governments. The footprint reduction potential of each city sector was aggregated to determine a plausible footprint reduction goal range, compared to the baseline scenario.

In this way it was found that, for instance, La Paz can reduce its projected carbon footprint by 41%, of which 15% is under the direct control of the municipal government. The rest is the responsibility of other actors, such as the private sector or the national government, with whom different levels of coordination are required. Also, about three quarters of the total reduction potential comes from the main contributor to the total footprint: the transport sector. This is also the case for the other cities, with Quito having a total carbon footprint reduction potential of 21% (17% under direct control of the municipal government), and Lima 13% (11% under direct control of the municipal government).

In terms of the reduction potential of the water footprint, La Paz could aim to reduce 44% of its projected footprint (27% under direct control of the municipal government, and mostly from the residential sector as the main contributor to the water footprint, as for the other cities). Quito could aim to reduce 86% of its projected footprint (almost entirely with own actions) and Lima could

Box 1: Pilot projects under the Cities Footprint Project in three Andean cities

La Paz, Bolivia

- **Integrated energy production and waste water reuse at the Municipal Zoo "Vesty Pakos" –** The municipal zoo, which contributes significantly to the municipal footprint, installed a closed-loop system that uses animal dung and waste water to produce thermal energy and liquid fertiliser. The project reaches about 5,000 visitors per week, many of them school students and teachers.

- **Solid waste management and family agriculture in peri-urban neighbourhoods –** In collaboration with the flagship 'Real Neighbourhoods' municipal programme and the 100-family neighbourhood of Kenanipata, one project built a greenhouse for local vegetable production. A group of women manage the solid waste management system, and other municipal units conduct training events, thus helping to reduce the city's carbon footprint and enhance its food security. Good replication potential and high-level political will could help this project reach 100 similar neighbourhoods.

Quito, Ecuador

- **City water footprint offset mechanism –** In collaboration with the Environment Secretariat of the municipality and the Fund for the Protection of Water of Quito (FONAG), this project has established a process to design a city-wide water footprint offset mechanism. Industries that volunteer to participate have their water footprints assessed, leading to the activation of an offset mechanism whereby companies invest an amount of resources proportional to the size of their water footprint in FONAG, which finances conservation projects. Participating companies then gain a certification of 'water neutrality' by third party verification bodies.

- **Municipal carbon footprint reduction through municipal government staff carpooling, on a voluntary basis** – A logistics company was hired to identify common commuting routes for staff from two municipal units: the Environment Secretariat and the waste collection company Empresa Pública Metropolitana de Aseo de Quito (EMASEO). The pilot project is expected to be scaled up, with the support of local regulations.

- **City carbon footprint reduction assessment through efficient lighting** – As public lighting is being replaced in the centre of Quito, the Cities Footprint Project is calculating the carbon footprint reduction of this initiative – through which about 3,000 efficient light bulbs were installed – along with the potential for city-wide replication.

Lima, Peru

- **Strengthening of the Ecoefficiency Committee** – Although it was created to oversee the mainstreaming of climate change into the operations of the municipality, the Ecoefficiency Committee had not fully achieved its objective when the Cities Footprint Project began. Therefore, the municipal government launched a communication campaign that delivered messages through interactive events with municipal staff, aiming to stress the importance of using less material, reducing waste, and using water and electricity more efficiently.

- **Supporting the Green Schools Programme** – With the objective of supporting the 'greening' of 30 municipal schools under this programme, individual footprint calculators were prepared for use by students. The project also launched a competition for the student and school with the lowest environmental impact, as well as providing educational materials on renewable energy, water and energy efficiency, and the importance of reducing, reusing and recycling.

aim to reduce 49% of its projected footprint (11% with actions of the municipal government). Most of this reduction would come from implementing waste water treatment plants for the domestic sector in each city.

The action plan development process revealed mainstreaming of climate change into development planning is already well underway in each city, although this has not always been explicit or even intentional (e.g. in the transport sector, the primary goal is improved urban mobility rather than footprint reduction). However, regardless of the initial motivation for footprint-reduction measures, it was evident that municipal governments welcomed the results of the project's assessments.

Models for other cities

As a result of project implementation, demand for similar assistance has arisen in several cities in the region – a clear signal of the success of the project. Box 2 describes some of the positive impacts generated by the project that were instrumental to triggering this demand in the region.

Challenges to project implementation

The main challenges encountered during the project's implementation in the three cities were changes in administration, unavailable data, lack of prioritisation by key stakeholders, political division between the national and local levels (in La Paz and Quito) and resistance to target-setting.

Changes in city administrations

In each of the three cities, mayoral elections took place within less than a year. In early 2014, mayoral elections took place in Quito and the incumbent mayor, under whom the project was launched, was not re-elected. Similarly, by the end of 2014, mayoral elections took place in Lima, and the mayor who requested support for the Cities Footprint

Box 2: Positive impacts from the Cities Footprint Project

Mayors and other high-level officials in the three cities are talking in terms of footprints and how having data (which was previously non-existent) enables more informed decision-making oriented to climate compatible development. Some of the beneficial effects of the project's activities include:

- **La Paz** – The mayor publicly hosted an event where he presented 10 actions to reduce the municipal government's footprints, providing investments in prioritised areas such as the municipal slaughterhouse. These were:
  1. Reduce energy consumption.
  2. Optimise the use of fuels.
  3. Minimise paper use.
  4. Promote sustainable transport modes.
  5. Promote the reuse and recycling of solid waste.
  6. Implement reforestation activities.
  7. Reduce water use.
  8. Reduce water pollution.
  9. Incorporate environmental considerations into procurement processes.
  10. Create and implement an eco-efficiency committee.

  He and other high-level city officials said they were satisfied with the results of the project, since it confirms that current efforts in the transport, residential and waste sectors were well-directed, not only from the traditional standpoint of development, but also for climate change mitigation and adaptation. In addition, two pilot projects related to conservation of water sources and efficient public lighting are currently being designed.

- **Quito** – The footprint 'language' has been appropriated by the mayor and high-level city officials, and has influenced various city plans related to water, energy and land use. Offset mechanisms for the carbon and water footprints in the city, developed with public and private actors, are in a design phase. The footprints also catalysed the mayor's proposal to create public–private partnerships as a strategy for city development, and companies on the frontline of climate change efforts have been officially recognised, under the "Sustainable Quito" Environmental Distinction, which rewards stewardship by private and public companies, citizens and schools, among others. The city has set an official target to reduce its carbon footprint, and the Metropolitan Footprint Reduction Program[13] has been created, under the Metropolitan Development Plan 2015–2025.

- **Lima** – During preparations for the 20th Conference of the Parties of the United Nations Framework Convention on Climate Change in December 2014, the Cities Footprint Project coordinated work with Peru's Ministry of Environment, beginning with a presentation at the World Urban Forum in Medellin earlier in the year. In collaboration with the regional movement of climate compatible cities, the agenda of the COP was influenced by including cities as one of the five main topics of discussion and giving the subject a huge exhibition space in one thematic pavilion during the conference. Cities are now receiving much more attention in climate change negotiations at international levels, and the project is believed to have influenced the decision to launch the National Programme for Sustainable Cities by the Ministry of Environment. Finally, financing for urban climate compatible development projects is starting to gain momentum, especially with CAF continuing its excellent working relationship with the municipal government.

La Paz, Bolivia.

Project was also not re-elected. In La Paz, mayoral elections took place in early 2015, requiring the elected mayor to renounce his post by the end of 2014 in order to stand for re-election, thus leaving a five-month transitory administration. These situations generated a degree of uncertainty about the priority given to the environmental agenda, and thus the continuity of actions initiated under the Cities Footprint Project.

Lack of data

Data required for footprint assessment is sometimes difficult to access, incomplete or simply non-existent; therefore, enough time and resources must be allocated for the demanding task of collecting data. Having a local focal person working inside the municipal government, who interacts directly with relevant stakeholders – both inside the municipal government and within the city – and who reports to the project, has proven to be a useful tactic. In Lima, in particular, the person hired by the project performed so efficiently that the municipality decided to extend her contract beyond the project.

Lack of prioritisation of project activities by key stakeholders

Unless the identified stakeholders see a benefit in sharing information and being engaged in a project, they are unlikely to collaborate actively. It is common to find stakeholders reluctant to be actively involved in what aims to be a participatory process, compromising successful project implementation. Often stakeholders have busy agendas and are reluctant to pay attention to new initiatives.

Political division between the national and local levels

Although not a fundamental obstacle, things would have gone more smoothly if dialogue was more open between national and subnational level representatives, especially in La Paz and Quito, where the local governing parties are in political opposition to the national governing parties. In particular in La Paz, the disconnect between national and local governments often leads to lost opportunities; for instance, transport reform projects are often approached from individual standpoints despite the opportunity to create synergies. Sometimes the national government may even try to block local government initiatives, such as delaying administrative processes for access to funds.

Resistance to target setting

Action plans determined plausible ranges for setting reduction targets for carbon and water footprints in each city, which led the project team to believe that target-setting would be a fairly simple task. However, the project encountered some resistance from the three municipal governments to define the level of ambition of their footprint reduction targets. This could be due in part to the level of long-term commitment that an officially set target carries, requiring this decision to be made at the highest political level. A reasonable argument presented by municipal governments to resist target-setting was that per capita carbon footprints in the three cities were well below global average. The impression is that setting a target could restrict development, which reveals a need for a far deeper paradigm shift than could be achieved through the implementation of a single project. However, simply starting this discussion, based on hard numbers, is definitely a step forward in the right direction.

Enabling factors for successful carbon and water footprinting in cities

Several factors were present in the three cities that made it easier to implement the Cities Footprint Project. These include capacity building and high-level involvement, strong political will, the presence of internal champions, stakeholder buy-in and ways to overcome the lack of data. These enabling factors are detailed below.

Capacity building and high-level involvement

The changes in city administration highlight the need to institutionalise

Quito, Ecuador.

the footprint assessment process, for instance by including related tasks in staff operation manuals. Capacity building and supervision need to accompany this process. Another risk mitigation measure is initiating footprint reduction pilot projects as practical, tangible examples that also send a strong message of municipal government leadership and commitment. Making the footprint assessment process as simple and automatic as possible allows it to be mainstreamed more easily into institutional operations, and this can be done by integrating user-friendly footprint assessment tools and related processes into existing technological and procedural systems.

Strong political will

The impulse generated for a process like this needs to come from the highest level of city administration. If the mayors are convinced that assessing footprints and preparing plans for their reduction is in their best interest and aligns with current development efforts, they will be more likely to express their commitment and gain the support of middle-level city officials. This is of the utmost value for successful project implementation.

Internal champions

Complementing strong, high-level political will is an internal champion within the municipal government who can help operationalise projects. Either a person or an organisational municipal unit can serve as a focal point through which work can be coordinated, other stakeholders identified and persuaded, meetings called, plans devised, and internal and external buy-in created.

Stakeholder buy-in

Each stakeholder may have different reasons for participating in a project (e.g. the private sector may be interested in promoting environmental and social responsibility, while other sectors may be attracted by financial benefits). Therefore, it is useful to analyse each actor in advance to better show them how they can meet their own objectives and agendas by actively participating in the project. Thus, communication and interpersonal skills are fundamental to the role of the champion, along with institutional contacts within the municipal government. Horizontal and vertical integration both inside and outside the municipal government are important co-benefits to communicate, as they catalyse synergies and win–win situations.

Strategies for overcoming the lack of data

Particularly within the municipal government, the data collection process should be institutionalised by including related tasks in staff operational manuals. Ideally, data such as consumption of basic services (electricity, water or gas) from all municipal units, and consumption of other relevant sources such as office materials and fossil fuel-derived products (gasoline and diesel), should be collected and recorded on a periodic basis, as outlined in the operational manuals. Data collection and processing mechanisms need to be designed, established, implemented and maintained through strong institutional leadership. Capacity building and supervision needs to accompany this process until it is consolidated in the functioning of the municipal government.

Implications of the Andean cities' lessons for other cities

It is essential that the project begins as a result of local demand for environmental management through the use of the carbon and water footprints. In the three cities, the mayors requested technical and financial assistance to assess the footprints of the municipal governments and the cities, which constitutes a clear signal of commitment from the outset. Without strong leadership by the municipal government, project implementation will most likely fail. It is advisable for future cities to have their municipal government pledge a financial counterpart offer in order to generate even more commitment, in the form of, for example, in-kind resources.

The project needs to support the goals of the municipal government and other local stakeholders in order to generate their buy-in. Local municipal government officials,

from high-level decision-makers to technicians and administrative staff, need to be convinced that the project supports the achievement of municipal goals, helps to operationalise current policies and plans – not only regarding climate change but for development in general. The same applies for sectoral stakeholders, who need to understand the benefits of becoming engaged in participatory processes. Only in this way can a real governance framework for city-wide footprint reduction efforts be achieved.

A collaborative process for the footprint assessment can help increase buy-in from municipal and city-wide stakeholders, generating horizontal and vertical integration within the city structure. Effectively communicating win–win scenarios and co-benefits to stakeholders, including capacity building of staff in the footprint assessment process and compliance with their own objectives, is often deemed as valuable and therefore makes active participation more appealing. Not only is maintaining an open and participative process beneficial in terms of working under a scheme of governance and transparency, it also increases efficiency and the ability to achieve desired results with limited resources. Institutionalisation of the footprint assessment process should be an explicit project outcome, in order to ensure the sustainability of measuring footprint-reduction performance over time.

A critical factor for the sustainability of results is capacity building of municipal government staff and institutionalisation of the process. Middle management and technical-level staff must be involved during the footprint assessment process to promote learning by doing – workshops have proven to be useful for this. To avoid the risk of discontinuation from high staff rotation, the footprint assessment process needs to be institutionalised, mainly by including it in the operation manuals and procedures of local governments. A local focal point that works with the municipality and reports to the project plays a key pivotal role.

Lima, Peru.

The identification of 'critical points' as a result of the footprint assessment process allows for local policy-makers to take informed decisions to reduce the carbon and water footprints of both the municipal government and the city. As a result of increased awareness of the problem, the municipal government of La Paz included waste water treatment items in its 2014 budget, while the one of Quito created the Metropolitan Footprint Reduction Program. A positive change in discourse could be evidenced in the mayors, high-level officials and technical personnel of La Paz, Quito and Lima.

Allowing access to finance and technology in order to avoid stagnation at the planning phase will help transit to the implementation phase. This is what municipal governments – and especially newly elected mayors – really want and need: material evidence of their commitment to climate compatible development. In this sense the municipal governments' prioritisation of projects identified in the action plans allows them to benefit from projects with positive financial and technical viability (the so-called 'low-hanging fruits'), mainly related with energy and water efficiency. For instance, the three cities have prioritised projects related to modernisation of public lighting and city-wide water footprint offset mechanisms, which need either their own or external financing and technology transfer.

Framing the project within local, national and international initiatives reinforces the chances of successful implementation, as the buy-in of stakeholders is critical. Given the new relevance of cities in the global climate change agenda, the footprint-reduction action plan of a city represents a pledge to the national process of transitioning to a climate compatible development path and a link between national and subnational processes. Also, the footprint assessment results allow cities to comply with international commitments, such as reporting their greenhouse gas inventories in

the framework of the Mexico City Pact, as well as voluntary initiatives. This helps cities gain international recognition as champions of climate-related topics, even increasing their chances to obtain financing for footprint-reduction projects.

Finally, the identification of critical points as a result of footprint assessment (e.g. diesel and gasoline in the transport sector, and grey water footprint in the residential sector) feeds into decision-making, awareness raising, changed discourses and enactment of public policy. Implementing pilot projects that tackle these critical points sends out a strong message of the municipal government's leadership and commitment to climate compatible development.

The explicit and public support of high-level decision-makers within the municipal government and other stakeholders to work on critical points, added to the industrious work of an internal champion to meet these high-level goals, are vital success factors on the path towards climate compatible development for cities.

Endnotes

1 www.citiesfootprint.com.

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