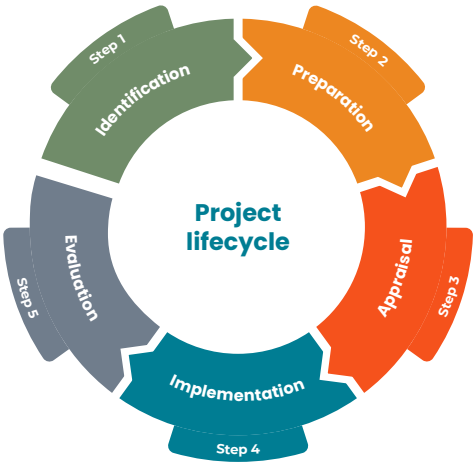
Enhancing Air Quality Outcomes in Transport Projects: A Case Study from Lima and Callao

The Air Quality Toolkit for Development Finance Institutions (DFIs) guides DFI Project Officers to include air quality considerations into their sectoral development projects, and track the associated air quality co-benefits by identifying meaningful monitoring indicators. The case study is framed around the core project lifecycle steps from Identification to Evaluation. At the concept *Identification* stage, it is important to establish if the project will have an air quality positive impact. During *Preparation* and *Appraisal*, the potential impact of a project on air quality is assessed, opportunities identified to enhance air quality benefits and indicators selected to be used in evaluation. *Implementation* and *Evaluation* involves ensuring that planned air quality benefits are realised during project delivery, collecting relevant data to track progress against indicators, and assessing the actual air quality outcomes after project completion.

OPPORTUNITIES TO MAINSTREAM AIR QUALITY THROUGHOUT A PROJECT LIFECYCLE



Project factsheet

Name

Development of Public Transport Master Plan for Lima and Callao

Date

2026 - 2028

Location

Lima and Callao, Peru

Sector(s)

Transport

Funders

Japan International Cooperation Agency (JICA)

Main objectives

Establish an implementation plan for environmentally friendly, efficient, economical, and sustainable public transportation services, thereby contributing to the sustainable development of the metropolitan area, including GHG reduction through key policies.

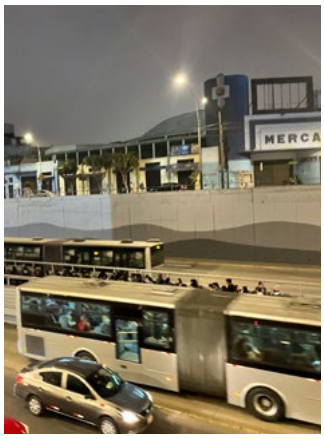
References

www.jica.go.jp/english/about/policy/environment/id/america/a_b_fi/peru/1560332_49586.html

www.atumovilidad.pe/#/inform/articles/article?articleId=6

Background and context

This case study looks at how the ongoing development of the Public Transport Master Plan for Lima and Callao could explicitly incorporate air quality considerations, and provides a roadmap for enhanced understanding of the potential air quality impacts and benefits. Annual air pollution levels in Lima and Callao, specifically PM_{10} and $PM_{2.5}$ particulate matter, are high, around five times the World Health Organization (WHO) Air Quality Guidelines. Road vehicle emissions are responsible for over half of the air pollution in the cities, driven in part by old, less efficient vehicles. According to data collected in 2023, up to 24.6 million trips are made in Lima and Callao daily: around 10.5 million (43%) by public transport, 24% via private car and 23% walking. Lima and Callao's Mass Rapid Transit (MRT) network commenced operations in 2014. As of 2023, only Line 1 was fully completed and operational, with Line 2 partly complete and operational. The other three planned lines have faced delays; as a result, the MRT network density and coverage is still relatively low.



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The Urban Transport Authority for Lima and Callao (ATU) is developing an "Urban Mobility Plan" (PMU). The PMU is a long-term strategic plan for urban mobility and transportation management that aligns with the development plans of Lima and Callao. It serves as a comprehensive master plan encompassing all modes of transportation. Meanwhile, the ATU recognises the need for a detailed master plan focused on public transportation systems. To respond to the need, JICA is supporting ATU in formulating a "*Public Transport Master Plan for Lima and Callao*," which will present a vision for the future of public transportation in the area.

The current planned MRT network mainly covers the residential area of higher-income groups and has poor access to low-income communities. The Public Transport Master Plan will set out options to modernise and expand the public transport network with more metro lines, corridors and feeder routes which will reduce travel times, improve connectivity between districts, and improve social inclusion. The plan also has a climate angle with an objective to reduce emissions of greenhouse gases (GHGs).

Identification of opportunities to improve air quality

At the time of writing there was no explicit consideration of air quality co-benefits incorporated into the Public Transport Master Plan, but there is huge potential for including air quality within its design with minimal amendments. Within the *Air Quality Toolkit for DFIs*, Appendix 1 lists example measures that improve air quality and can be used to identify potential opportunities for air quality co-benefits to be incorporated into projects. The table below highlights some of the project's key existing solutions which can be more actively related to air quality co-benefits.

Public Transport Master Plan solutions	Opportunities for air quality improvements
Improve access to public transport through new MRT routes, bus corridors and cable cars.	Provides high-capacity, low-emission alternatives to private cars, reducing number of vehicles on the roads.
Reorganise the licensed bus network.	Streamlining feeder services, reducing redundant trips and inefficient routes will increase network efficiency.
Traffic management measures, e.g., priority lanes for buses.	Improves bus speeds and reliability, reducing stop-start driving and fuel consumption, reducing emissions.
Implement congestion tax and/or parking controls.	Limits car access and encourages modal shift to public transport, reducing traffic-related emissions.
Intelligent Transport System technologies for public transport operation and tariff collection.	Optimises bus operations and tariff collection, reducing delays and improving fuel efficiency, which reduces tailpipe emissions.

Further actions could be considered for incorporation into the Public Transport Master Plan to optimise the air quality co-benefits; some examples are listed below. Following identification of potential options, the 'Initial Feasibility Assessment Checklist' in Section 2.2.3 of the *Air Quality Toolkit for DFIs* can be used to refine the list, before in-depth options assessments take place.

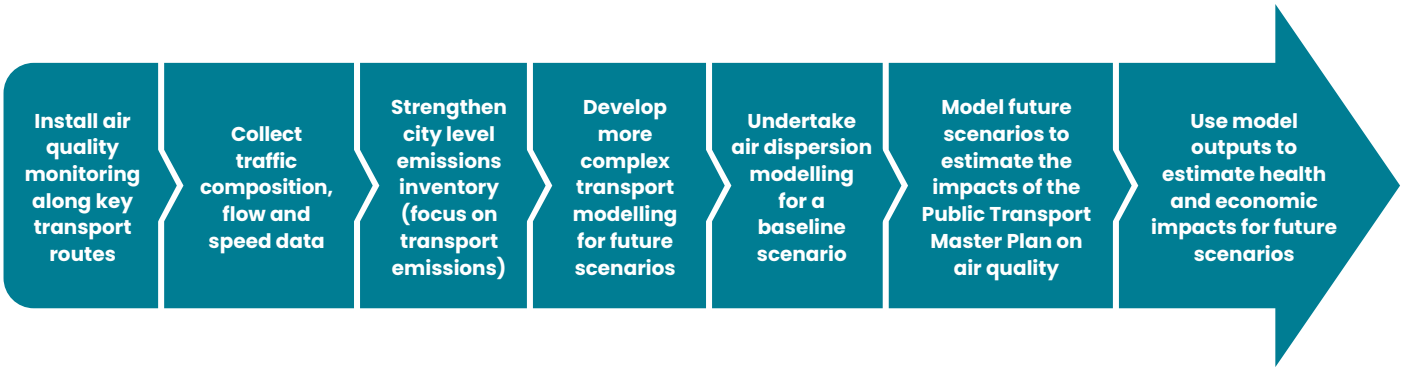
Additional options for optimizing air quality co-benefits within the project

Investment in a low-emission bus fleet (Euro IV / electric)	Improved testing and inspections for public transport vehicle fleets	Promoting and incentivising the use of public transport

Preparation and appraisal

To assess current transport patterns and air quality in the city, existing data collection was leveraged together with detailed data gathering undertaken by the PMU in 2023 on travel behaviours and impacts across the city. Surveys were conducted with local communities to gather detailed information about residents' travel behaviour. These surveys captured data on the types of journeys people made, including their chosen modes of transport, trip frequency, and length. Responses were collected through both digital platforms and in-person outreach, ensuring broad participation and representation. Pollutants including nitrogen dioxide (NO_2), particulate matter and sulfur dioxide (SO_2) are monitored at a number of roadside locations in Lima and Callao; this data can be used to evaluate baseline levels of air pollutants across the city. Lima also has an existing emissions inventory, which is a key source of data that can be utilized to understand baseline conditions, and feed into subsequent emissions and dispersion modelling to help understand the likely air quality impacts of the Public Transport Master Plan.

A key output of JICA's project is to develop a number of scenarios for the future layout of the trunk public transport network in Lima and Callao. There is therefore scope within the preparation phase of the Public Transport Master Plan to further assess air quality impacts of the scenarios. Section 2.2.4 of the *Air Quality Toolkit for DFIs* provides details on options for assessing these impacts both qualitatively and quantitatively. The figure below sets out an example of an optimum model for further assessment to allow air quality co-benefits to be fully understood and quantified. These are loosely arranged in order of complexity, with each individually contributing valuable information to the assessment of air quality co-benefits, but together as a holistic approach providing the optimum level of information for informed policy development. Such data collection activities are also invaluable for feeding into a robust Monitoring, Evaluation, and Reporting (MER) which includes indicators to track the air quality co-benefits. The MER Checklist in the *Air Quality Toolkit for DFIs* provides key factors to note when developing a data collection plan that considers air quality.



This case study demonstrates how explicit air quality co-benefits could be identified from the future Public Transport Master Plan for Lima and Callao at the city scale. It highlights how the existing solutions will already have an air quality co-benefit, and suggests further measures that could be considered. It also explores options for improved quantification of the air quality impacts on health and the economy. For more information on how these concepts can be applied to other development projects, please see the *Air Quality Toolkit for DFIs*.

Written by:

RICARDO
Member of **WSP**

www.ricardo.com

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