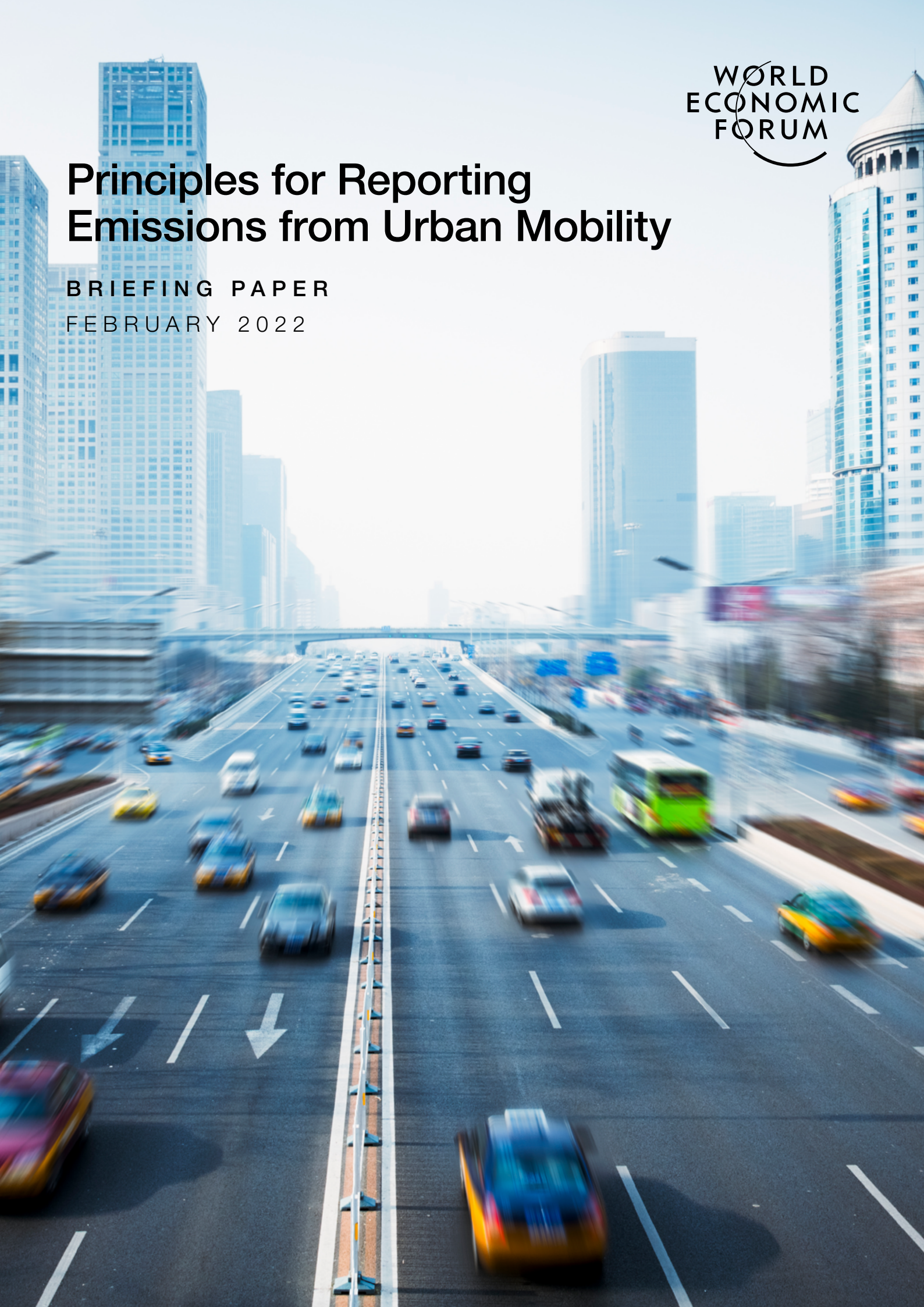
WORLD ECONOMIC FORUM

Principles for Reporting Emissions from Urban Mobility

BRIEFING PAPER

FEBRUARY 2022



Cover: @chinaface/Gettyimages

Contents

Below: @LeoPatrizi/
Gettyimages

Introduction

About 18% of global energy emissions can be attributed to road vehicles, of which 60% come from passenger vehicles. Moreover, these emissions are on the rise. Through a combination of solutions, including new mobility technologies that can improve vehicle sharing and utilization, and switching to electric vehicles and lower-carbon transport modes, in-use related emissions can be reduced to zero or near-zero levels at the tailpipe, while enabling a vibrant, efficient and effective urban mobility system.

An increasing number of cities and mobility operators and providers report on annual carbon emissions to create better insight on their carbon footprint and to track their progress towards meeting carbon reduction goals including those set by Science Based Targets. Their carbon accounts usually include Scope 1 and 2 emissions and, increasingly, Scope 3 emissions, in line with the Greenhouse Gas (GHG) Protocol and existing and emerging guidance on how to apply this in specific sectors.

Nonetheless, carbon accounts of transport emissions at the level of individual mobility operators and providers and the cities and regions they operate in do not sufficiently inform us about the emission intensity of urban "trips", which may be served by multiple, alternative mobility operators or providers or even a combination of them.

Shifting mobility landscape

Knowledge Box 1: Principles and collaboration guidelines

The rapid pace of technology-driven innovation from the private sector in shared transport services, vehicles and networks will have a profound impact on urban livelihoods, congestion and urban land use. At the same time, city streets are a finite and scarce resource. As a result, various principles and guidelines developed for new mobility and decarbonization efforts have been released over the last years. The Shared Mobility Principles (2017) were developed by a working group of international NGOs as a guiding framework for urban decision-makers and stakeholders to navigate the shifting transport landscape while prioritizing the best outcomes for all. Additional frameworks aimed at fostering public-private collaboration towards decarbonized and efficient mobility include the policy handbook, Shared, Electric and Automated Mobility (SEAM) Governance Framework (2019), the Guidelines for City Mobility (2020), the Privacy Principles for Mobility Data (2021), and the Zero Emission Area (ZEA) Handbook (2021). At COP26, governments, organizations and businesses have committed to rapidly accelerate the transition to zero emission vehicles by 2040 – 2035 in leading markets. City Mayors came together in 'commitment to walkable cities that put people first' and include major areas that are zero emission by 2030 in the Green and Healthy Streets Declaration.

Purpose and scope

Mobility operators and providers: Public sector entities and private sector companies serving the movement of people and/or things, including mobility platforms (2-, 3- and/or 4-wheel vehicle ride-hailing), Mobility-as-a-Service, shared micromobility (electric and non-motorized), taxis (2-, 3- and/or 4-wheel vehicle), transit (bus, taxi, train, microtransit, subway, rickshaws), logistics, parcel delivery, grocery and other services delivery, automotive OEMs.

As the concept of "mobility-on-demand" increasingly gains a foothold in thinking about the effective, efficient and convenient movement of people between locations, the principles presented here aim to support carbon accounting efforts to better understand urban mobility's operational emission intensities.

The principles are primarily aimed at decision-makers at mobility operators and providers and cities. The principles provide guidelines and recommendations for mobility operators to consider when accounting for operational emission intensities. Consistent and coherent reporting that is comparable across mobility operators and providers of varying modes will yield enhanced insight into operational emission intensities and better inform decisions for the optimal transport modes or "modal mixes" to pursue for specific mobility needs.

In doing so, city policy-makers can better leverage operational data in their efforts to create and invest in the right enabling environments for urban mobility. Mobility operators and providers can be acknowledged and rewarded for efficient and innovative mobility operations and multi-modal solutions, and passengers can reference easy-to-understand and consistent information when choosing from mobility options available.

As such, a multistakeholder group of leading companies and thought leaders, facilitated by the World Economic Forum's Global New Mobility Coalition (GNMC), have prioritized seven principles to help ensure that emissions intensity accounting and reporting for urban mobility trips becomes more standardized, consistent and comparable. The principles are organized in three parts: foundational approaches, scope of accounting and reporting, and leveraging insights.

The principles that we share here are predominantly focused on in-use carbon emissions, given the purview of cities and operators, and the relative infancy of urban mobility lifecycle carbon accounting and reporting as well as policy-making. We hope that the principles will ignite and steer the debate on voluntary urban mobility carbon emissions intensity accounting and reporting and its contribution to low-carbon urban mobility systems.

Below: @Bim/Gettyimages

Established frameworks and protocols for emissions accounting and reporting

Knowledge Box 2: Smart Freight Centre's GLEC Framework for logistics emission accounting and reporting, and the upcoming ISO 14083 standard

Recognizing that comparing GHG emissions in different modes of transport can be like comparing dissimilar things, the Global Logistics Emissions Council (GLEC) was established as a voluntary partnership by NGO Smart Freight Centre, a global non-profit focused on efficient and zero-emission freight. The resulting GLEC Framework is currently the only globally recognized methodology for harmonized calculation and reporting of the logistics GHG footprint in the multi-modal supply chain, and can be implemented by shippers, carriers and logistics service providers.

The GLEC framework forms the foundation for the freight component of the new International Organization for Standardization (ISO)/ Draft International Standard (DIS) 14083 standard "Quantification and reporting of greenhouse gas emissions of transport operations", which is currently under development. The new ISO standard "will establish a common methodology for the quantification of energy consumption and GHG emissions related to freight and passenger transport operations. It will specify general principles, definitions, system boundaries, calculation methods, apportionment rules (allocation) and data recommendations, with the objective to promote standardized, consistent, credible and verifiable reporting, regarding energy consumption and GHG emissions related to transport."

Knowledge Box 3: Global Protocol for Community-Scale GHG Inventories

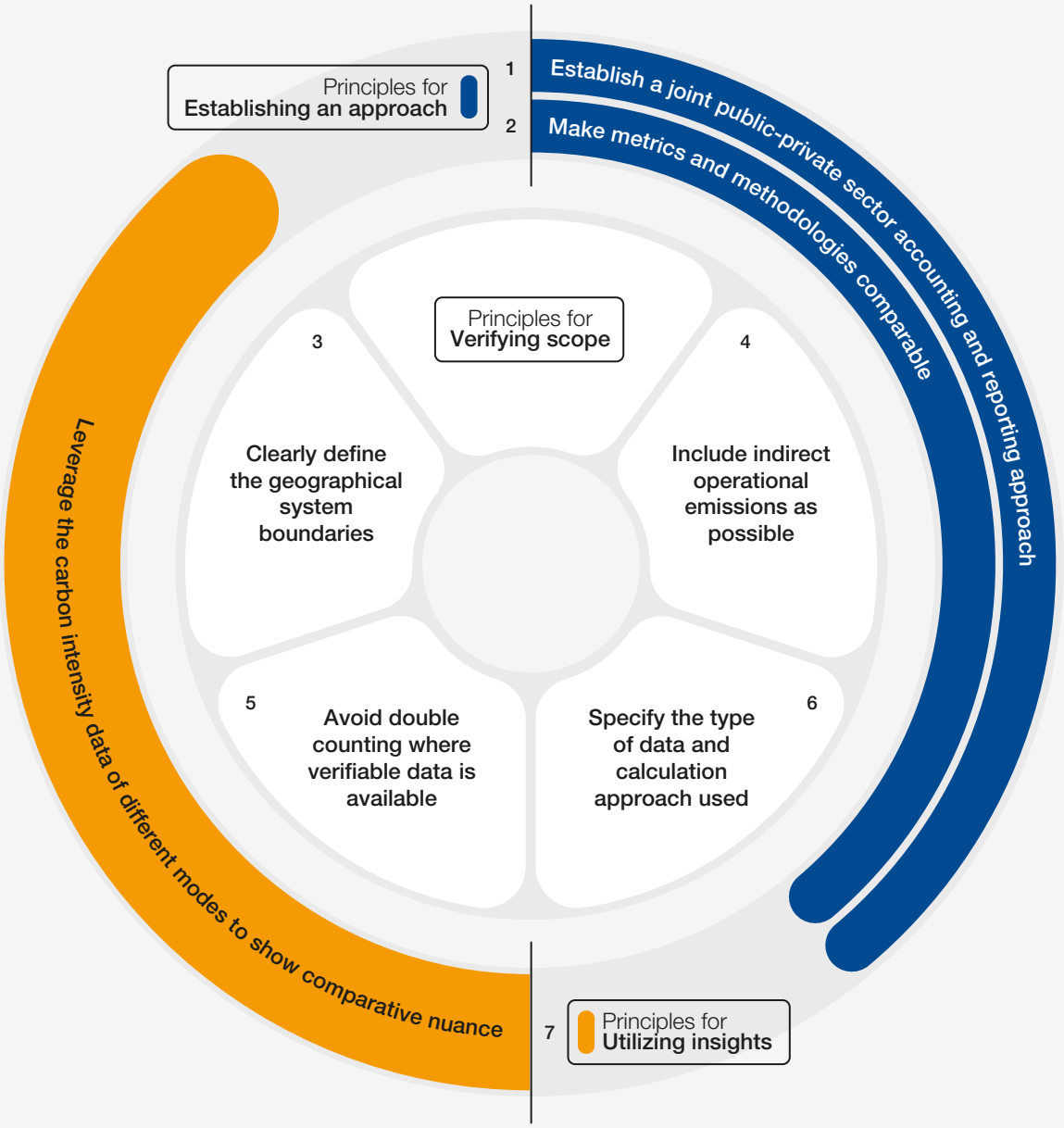
The Global Protocol for Community-Scale (GPC) Greenhouse Gas Emission Inventories was developed in response to the challenge of creating greater consistency in GHG accounting for cities to allow for more credible and meaningful reporting. It offers a robust and clear framework that builds on existing methodologies for calculating and reporting city-wide GHG emissions.

Using the GPC, cities measure and disclose a comprehensive inventory of GHG emissions and total these emissions using two distinct but complementary approaches. One approach captures emissions from both production and consumption activities within the city boundary, including some emissions released outside the city boundary. The other approach categorizes all emissions into "scopes", depending on where they physically occur. Separate accounting of emissions physically released within the city boundary has to be used for aggregation of multiple city inventories to avoid double counting.

Below: @Marco_Piunti/
Gettyimages

Principles for Reporting Emissions from Urban Mobility

FIG 1 | Principles for Reporting Emissions from Urban Mobility



Principle #1 Establish a joint public-private sector accounting and reporting approach

In order for urban mobility emission intensity reporting to be widely accepted and understood by relevant stakeholders and enjoy broad uptake, mobility operators and service providers, cities and other relevant stakeholders should closely engage and collaborate to agree on a joint accounting and reporting approach in their market or urban area. This includes clarifying how and why such an approach differs from other accounting methods, particularly those that serve the purpose of carbon footprint accounting for an organization or within a jurisdiction.

The set of principles proposed here offers a preliminary foundation for such an approach with a view to support users with decision-making on preferable or optimal mobility modes and combinations thereof to fulfil certain urban trips.

Principle #2 Make metrics and methodologies comparable

The lack of a standardized, harmonized approach for accounting and reporting on the carbon emission intensity of urban mobility makes it difficult for users, mobility operators and service providers and cities to truly understand and compare carbon emissions and reductions across all mobility modes, whether used individually or in combination to complete a trip. Some precedents already exist – fuel efficiency is often used as an intensity metric to understand the carbon impact per mile (or kilometre) of petrol-fuelled vehicles. Particularly in urban areas, with a vibrant landscape of current and emerging urban mobility modes, the fuel-efficiency metric holds limited relevance to compare between modes.

Instead, passenger carbon intensity – emissions per passenger distance – would be a more meaningful metric to understand emission intensity-related performance of different mobility modes. It suggests that relevant mobility operators and service providers and cities should ensure agreement on the use of similar metrics and methodologies to allow for meaningful comparisons between operators and providers and modes.

Principle #3 Clearly define geographical system boundaries

Unlike sectors with stationary emissions, transport is, by definition, mobile. This can pose challenges in accurately calculating and allocating its emissions. When considering urban mobility, we can, in essence, distinguish between trips that stay within or go beyond a city's geographical boundaries. Different approaches exist on how to accurately account for transboundary trips in urban mobility, ranging from accounting for all trips induced by a city, or counting only the portion taking place within city boundaries, to only accounting for trips taken by city residents. They all have their usefulness in certain circumstances. As urban mobility reporting becomes more commonplace, it is crucial that mobility stakeholders agree on a set of consistent system boundaries to be applied to emission-intensity accounting.

As a starting point, it is proposed to use a set of boundaries that accounts for urban mobility emissions that are within the city regulator's capacity to act, which generally means within the municipal geographical boundaries. This would align with a city's so-called scope 1 transport emissions, which include all in-boundary transport. Out-of-boundary portions of trips, aligning with scope 3 transport emissions for a city, would be accounted for separately. Where possible, more nuanced approaches for boundaries can be adopted to maintain consistency with existing accounting practices.

Principle #4 Include indirect operational emissions as possible

To move people from one location to another in a city, emissions may result from several activities not directly associated with the actual trip. Think, for instance, of the distances covered to move vehicles to the point where they start picking up passengers and to return them to base at the end of day; as well as off-trip mileage between trips, particularly for flexible transport modes such as ride-sharing and on-demand buses. Equally, emissions occur as a result of the efforts associated with refuelling, maintaining, servicing, parking or relocating vehicles in preparation for passenger service.[1]

This even applies to non-motorized mobility modes such as bicycles in a bike-sharing system, which may have to be relocated between docking stations to ensure sufficient supply at popular locations. By including such indirect operational emissions in the emission-intensity profile of a mobility mode, stakeholders will gain better insight into the efficiency for each mode. This would allow to better understand which mode of travel optimizes the movement of people versus moving and servicing mobility assets.

Some of these indirect emissions may be covered by applying additional emission factors, which is an agreed estimate based on industry averages. Preferably, stakeholders come together to consent on the applicable emission factors to use. In freight, for instance, the members of the Clean Cargo Working Group have identified and agreed on emission factors of container vessels for a set of the world's most popular shipping trade lanes.

Nonetheless, further work will likely be needed to better understand where and which emissions can be accurately allocated to mobility services on a per-passenger-mile (or passenger-kilometre) basis.

Principle #5 Avoid double counting, where verifiable data are available

There is a clear need to avoid double-counting particular vehicle miles (or kilometres) travelled. Take ride-sharing and related services, which have become increasingly popular, with multiple platforms operating in many markets. A recent study by the California Air Resources Board (CARB) suggested that almost 11% of vehicle miles travelled in California during the period measured overlapped between at least two companies, as drivers may be simultaneously operating on more than one platform, from providing passenger mobility (travel) to even delivering food or parcels (logistics/deliveries). This signifies the importance of stakeholders looking into the issue of how to allocate vehicle miles and subsequently to agree on an approach that allows for consistency and comparability while preventing considerable emission leakage or overcounting in the relevant individual carbon accounts. For instance, mobility providers and intermediary platforms could share data with a group of key stakeholders to analyse the potential for duplication in carbon accounts and jointly identify solutions.

Principle #6 Specify the type of data and calculation approach used

Depending on the urban mobility mode and means, mobility operators and service providers may have access to higher or lower accuracy levels of data, and either estimated or real-world data on trips and emission sources. Some will even need to resort to averages and reasonable assumptions of real-world activity, combined with the use of emission factors.

The type of data used has a direct influence on the accuracy of the results and hence the degree to which these results can be used to track and compare emission intensities. For example, on a ride-sharing or on-demand public transport service, pooled trips can result in detours to pick up and drop off passengers. In this case an estimation of the trip emissions using a model inputting the most direct route between two points would generate a different result from a calculation based on real-world data. Without knowing the quality and accuracy of the data used, one could be comparing "apples and oranges" without even realizing it.

It is, therefore, crucial that actors clearly specify the type of data as well as the calculation approach used. Ideally, stakeholders would classify input data into different categories, setting joint criteria or standards for data quality and robustness for the different types of direct and indirect emissions associated with operating urban mobility modes, as well as agree on eligible calculation approaches, to facilitate consistency and comparability. An example of this is the data and calculation guidance provided in the Global Protocol for Community-Scale GHG Inventories. Eventually, it will be important as well that the aggregated data is shared with users when they consult different travel options to help inform consumer decisions.

Principle #7

Leverage the carbon-intensity data of different modes to show comparative nuance

Enhanced insight into the carbon intensity of urban travel across all available options to accomplish a set of trips would serve as a meaningful addition to the field, enabling direct comparisons between single mode, multimodal and shared modes for completing urban trips. An example of this would to be compare the carbon intensity of a commute involving a pooled ride-share in the suburbs to a Park & Ride train station versus taking an express bus into the city with a bicycle-sharing scheme to cover the first or last mile, incorporating direct and indirect emissions related to the operation of the mobility assets. Because the carbon impacts of operating a mobility system extend beyond fuel, including the resources leveraged to provide the service such as the vehicle assets as well as urban land use for parking and roads, one may even consider combining a passenger carbon emission-intensity metric with additional metrics such as a travel-efficiency metric. Together they provide a more nuanced insight into the operation of mobility assets. The latter metric would indicate how a specific mode of travel optimizes the movement of people over vehicles or other mobility assets, defined as a ratio of person distance travelled (in miles or kilometres) and vehicle or mobility asset distance travelled, accounting as well for non-passenger distance travelled to relocate vehicles or to travel to a pick-up location.

Below: @LeoPatrizi/ Gettyimages

Below: @honglouwawa/Gettyimages

Recent reporting from Global New Mobility Coalition members

Knowledge Box 4: Gojek's first carbon emission inventory

In 2021, mobility and multi-service platform Gojek published its first GHG inventory as part of its first annual Sustainability Report. It serves as a baseline for its Zero Emissions by 2030 target, and forms part of a commitment to annually track and disclose its carbon performance on the road to carbon neutrality.

For its inventory, Gojek aligned with the GHG Protocol, utilizing an operational control approach, meaning that emissions within the boundaries of its operational control were accounted for, including CO_2, CH_4 and N_2O gases. Gojek sourced its emission factors from recognized sources such as the Department of Environment, Food & Rural Affairs (DEFRA) of the United Kingdom and the Institute for Global Environmental Services (IGES).

Knowledge Box 5: Uber reports on carbon emission intensity of trips

In 2019, in consultation with the World Resources Institute (WRI) and Fehr & Peers, Uber released a methodology for calculating the passenger carbon intensity of trips facilitated by ride-hailing networks or any other passenger transport service. Since 2020, Uber has reported publicly on passenger carbon-intensity performance of trips completed using its app. In December 2021, Uber published its second annual Climate Assessment and Performance Report evaluated electric vehicle and hybrid use, and passenger carbon intensity for all passenger trips facilitated by Uber from 2020 through the first half of 2021 in the United States, Canada, and 7 major markets in Europe (Belgium, France, Germany, the Netherlands, Portugal, Spain, and the United Kingdom).

Knowledge Box 6: TIER, Voi and Lime embrace carbon emission intensity reporting

Many micromobility operators have started reporting in recent years on carbon emissions per passenger mile (or kilometre). For instance, TIER, a shared micromobility provider, has been tracking the carbon emission intensity per passenger kilometres (CO2/pKm) of its e-scooters for the past few years. This has resulted in design improvements, leading to a 60% reduction in CO2/pKm. Voi, a shared e-scooter provider, has been tracking well-to-wheel CO2/pKm for its e-scooters and is implementing a variety of measures to reduce their footprint, including a 400% increase in scooter lifespan. E-bike and e-scooter company Lime meanwhile is developing a Science Based Target for the company's scope 1, 2 and 3 emissions.

Contributors

Authors

The Principles for Reporting Emissions from Urban Mobility are a joint effort of the members of the World Economic Forum's Global New Mobility Coalition (GNMC), a network of 200+ globally renowned experts, NGOs and companies.

GNMC seeks to accelerate a synched transition to shared, electric, connected and autonomous mobility (SEAM) solutions to provide for healthier cities, reduce carbon emissions and improve mobility efficiency while creating new business opportunities. For more information, contact mary.loane@weforum.org or visit weforum.org/projects/global-new-mobility-coalition.

Contributors

Renilde Becqué
Consultant, Global New Mobility Coalition

Maya Ben Dror
Manager, Automotive Industry
Shaping the Future of Mobility
World Economic Forum

Mary Loane
Lead, Global New Mobility Coalition
Shaping the Future of Mobility
World Economic Forum LLC

The Forum thanks the GNMC members who contributed to the co-designing these principles and provided ongoing insights and feedback.

Additional thanks to Ann Brady for copy-editing, Albert Badia Costa for graphic design and Ralitsa Souchon.

Endnotes

1. Embodied emissions from upstream and downstream activities such as from vehicle manufacturing, fuel production and/or electricity generation, as well eventual vehicle disposal and recycling, as well as the emissions resulting from the general activities of the organizations facilitating the mobility services, such as the operation of an online mobility platform, are considered to fall outside the scope of the decision-making the Principles for Reporting Emissions from Urban Mobility aim to inform. Over time, however, it is expected that mobility operators and service providers and cities will increasingly start to move towards whole lifecycle accounting.

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

The World Economic Forum, committed to improving the state of the world, is the International Organization for Public-Private Cooperation.

The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas.

World Economic Forum
91–93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland

Tel.: +41 (0) 22 869 1212
Fax: +41 (0) 22 786 2744
contact@weforum.org
www.weforum.org