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Toward Developing a Mobility and Gender Index

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Transport Global Practice

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ABBREVIATIONS AND ACRONYMS

BRT	Bus Rapid Transit
EIGE	European Institute for Gender Equality
GDP	Gross Domestic product
ILO	International Labour Organization
MENA	The Middle East and North Africa
MGI	Mobility and Gender Index
OECD	Organization for Economic Co-Operation and Development
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UN Women	The United Nations Entity for Gender Equality and the Empowerment of Women
WBL	Women, Business, and the Law
WEF	World Economic Forum

ABSTRACT

Although the benefits of a gender-inclusive approach to mobility for transport decarbonization, access to jobs, and human capital advancement have been increasingly recognized globally, this topic has not received sufficient attention. The lack of attention to gendered mobility barriers is partly due to a limited understanding of the wider benefits of inclusive transport services for development, which is caused by the absence of sex-disaggregated mobility data highlighting gender inequalities.

One of the obstacles to this gender-inclusive approach is the absence of a global gender indicator to track gender-based inequalities in mobility across countries and time. The lack of such an index (i) hinders policymakers and development agencies from prioritizing this issue, setting project, program, and policy priorities, and monitoring performance, and (ii) discourages efforts to improve the quantity and quality of sex-disaggregated data related to mobility.

This paper summarizes the exploratory research conducted by the World Bank's Transport Global Practice in 2022-23 to construct a Mobility and Gender Index (MGI). The report presents a six-dimension theoretical framework, outlines data pre-processing and indicator selection procedures, and describes the technical steps taken to develop the measurement framework for the index. Various approaches for measuring gender gaps and levels are explored, with potential aggregation within dimensions and the presentation of scores.

The report includes visualizations of some of the dimension scores as heatmaps and highlights key findings. Finally, it acknowledges data gaps and outlines the necessary next steps to develop the MGI.

1 INTRODUCTION

Addressing mobility challenges that both women and men but especially women (and girls) experience has both intrinsic and instrumental value: intrinsic value, as the ability to move around represents a basic freedom for everyone, and instrumental, since mobility is critical to accumulate human capital by, for example, accessing health and education, and to get desired jobs. There is also an environmental imperative for addressing gendered mobility barriers. Globally, women rely more heavily on public transport and walking than men. However, women's mobility patterns are often not a matter of preference but necessity. Care responsibilities, reduced access to a car, and less disposable income shape women's transport choices and have an unintended, albeit the environmentally desirable result of a lower carbon footprint than men. This means that without interventions to make transportation more amenable for all, and especially for women, an increase of women in the paid workforce could see their use of cars converge with men's use over time. In addition, while women's lower carbon footprint may be desirable environmentally, their current travel patterns, which are localized, are also barriers to their economic independence and their full participation in economic life. In this context, adopting a people-centered, inclusive approach to mobility is vital not only for women's and girls' social and economic empowerment but for a just transition to the decarbonization of transport (Munoz-Raskin et al, 2022).

Although the benefits of a people-centered approach to mobility for transport decarbonization, jobs, and human capital advancement have increasingly been recognized within the World Bank and globally in the development discourse, this topic has not received the utmost attention it deserves. The lack of adequate attention is partly due to a lack of a fuller understanding of the wider benefits that gender-responsive transport service brings to development, which itself is caused by the lack of sex-disaggregated mobility data, which would highlight gender gaps in mobility. One of the stumbling blocks is the absence of a global gender indicator that would track gender-based mobility issues across countries and time. The lack of such a composite index (i) prevents policymakers and development agencies from drawing adequate attention to this issue, setting project, program, and policy priorities, and benchmarking and monitoring performance across countries and times, and (ii) hampers enthusiasm to improve the quantity and quality of data collected in the area of gender and mobility.

Despite the dearth of sex-disaggregated mobility data, in 2022-23, the World Bank's Transport Global Practice (GP) undertook analytical work to explore the feasibility of creating a global Mobility and Gender Index (MGI), which would track progress in reducing gender-based inequalities in mobility across countries and time. The work resulted in a conceptual framework with six broad analytical categories (or "dimensions") that could be used to underpin the empirical measurement of mobility from a gender perspective and provided an overview of a shortlist of indicators that could be included in a corresponding measurement framework to support the proposed six dimensions and to build the desired index. The conceptual framework is summarized in the chapter 2 of this Paper.

The study concluded that due to data limitations at the time of research, an index measuring gender inequalities in mobility cannot be computed with the available open-source data, either for the world or for any specific region with more advanced data availability. The work determined that there are not enough data for most countries and for most of the indicators of interest. Instead, the team (i) constructed scores for five out of the six dimensions using the publicly available limited data as well as the Gallup dataset, which the team purchased since the latter includes a number of relevant indicators in the area of gender and mobility, and (ii) is currently developing a dashboard to visualize these scores. The chapter 3 of the paper provides the measurement framework detailing steps from the computation of dimension scores to their aggregation. The chapter 4 provides some of the preliminary visualizations of the dimension scores, and the chapter 5 concludes with the proposed next steps.

1.1 The value added of this research

This report presents an initial attempt to construct a Mobility and Gender Index (MGI), though these efforts have been hindered by significant (gender) data gaps. Nevertheless, the report:

- Pioneers a robust cross-sectional measurement framework of gender and mobility that has been subjected to rigorous theoretical and empirical validation for the first time.
- Provides a platform for various stakeholders, ranging from policymakers to development agencies, to identify the areas where (gender) data gaps exist.
- Advocates for more consistent and higher quality data collation.

Given these characteristics, this innovative instrument can serve a dual role as a diagnostic mechanism as well as an instrument for advocacy.

1.2 Limitations

This research faced several limitations. Firstly, our work was unable to go beyond a binary understanding of gender, as the data were only available for the sex categories of female and male. We recognize the inherent complexity and range of gender identities and are conscious of the limitations imposed by this binary perspective. Secondly, we were unable to integrate an intersectional perspective into our analysis. We are fully aware of the systematic disadvantages women encounter in society, which are created and perpetuated by power inequalities and that intersect with gender – aspects that the MGI does not currently capture. Despite this intersectional data gap, measuring inequalities based on sex provides useful insights that cut across other forms of disadvantage, helping improve mobility for minoritized and marginalized groups, even where data are unavailable.

Our study also incorporates Gallup data, which are not publicly accessible and requires an annual subscription. While the cost of this resource is not considerable, securing annual funding represents a potential challenge for the sustained progression of this project. Also, as it currently stands, this work does not allow comparisons over time. However, this is a feature to consider in future iterations, once a more robust measurement framework is established and, importantly, when more indicators become available. Finally, our study does not currently employ 'big data'. We examined traditional data sources, such as surveys, censuses, and administrative records, along with alternative 'big data' sources, like Facebook API, satellite data, and individual mobile phone data. While these sources offer information on specific movement patterns of individuals, they present data at the micro-level, limiting our ability to aggregate it at the national level without more advanced mapping analysis tools. Therefore, big data was excluded from the current research. However, as we secure more data and analytical tools and as our work on the index advances, the potential for incorporating big data can be further explored.

2 CONCEPTUAL FRAMEWORK

Research on transport and mobility has historically been gender-blind in that it has failed to consider how women and men (and other gender groups outside this binary) might have different experiences (Law, 1999). However, the new perspectives for understanding the role of mobility in recent years have brought greater concerns for existing gender inequalities in the sector, which encouraged quite a lot of research in this area (Alam et al, 2022). Yet, the studies considering a gender perspective typically focus on women, thereby conflating gender dynamics with the experiences of women alone. Men (and other gender groups) also have a gender, and as such, have a gendered experience of transport and mobility. Also, most studies examine topics related to the productive sphere – i.e., commuting from home to a paid workplace – and less so other topics related to caring activities, which disproportionally fall to women, and thereby not representing women's mobility and transport perspectives adequately.

A feminist perspective on gender and mobility is needed to better unpack what might be the gendered social and cultural geographies of mobility. Sánchez de Madariaga (2013) calls for looking into the 'mobility of care,' that is, giving a more balanced focus on paid and unpaid work when researching or developing policies on transport and mobility. Doing so would not only benefit women – though their experiences would be less invisible as a result – but would benefit all, as better care within the family or the community will provide better societal outcomes for all, irrespective of their sex or gender.

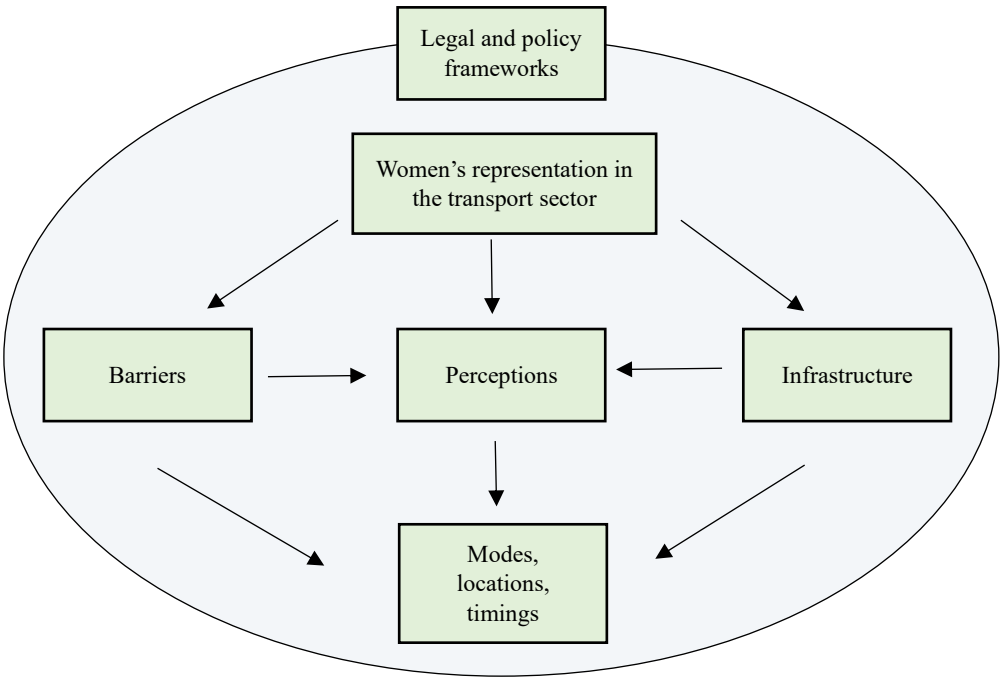
Examining social and cultural geographies of mobility cannot be done without also looking into the different needs and patterns across industrialized and developing countries, as well as intersectionalities between sex, gender, and other factors such as age, ethnicity, disability, race, location, sexual orientation, or income. For instance, the needs of a woman with a disability living in a rural part of a country with poor public transportation will be qualitatively different from those of a non-disabled woman in a city with at least some options for urban transportation. In a similar vein, an elderly low-income man with limited mobility would have more acutely pronounced mobility needs than an able-bodied young man with more resources to afford private transportation (Kurshitashvili et al., 2022).

It is worth repeating that women's and men's daily lives can differ significantly. Differences apply globally, with variations as to their intensity rather than any discernible differences in how they play out in different countries, as illustrated by various global measures of gender inequalities, e.g., World Economic Forum's (WEF) Global Gender Gap Index, the Gender Inequality Index of the United Nations Development Programme (UNDP), and the Gender Equality Index of the European Institute for Gender Equality (EIGE). Gender inequalities can be considered as outcomes – e.g., employment, education – that result from social norms and institutions present in different countries and that contribute to gender inequalities. Social institutions influencing women's and men's mobility often include but are not limited to household division of labor, norms about what is permissible for women and men to do, or laws that discriminate on the basis of sex or gender, e.g., the Social Indicators and Gender Index of the Organization for Economic Co-Operation and Development (OECD).

One of the starkest gender inequalities that affects mobility is the division of time and responsibilities for paid and unpaid work, as it means that women and men have different needs and that mobility options respond unequally to these different needs. Gender inequalities are best understood as influenced by factors that play out at the micro- (e.g., education, income), meso- (e.g., family as an institution, rural/urban location), and macro-levels (e.g., national policies and legal frameworks). The topic of gender and mobility is no exception, and it is therefore useful to examine it as such (for an ecological framework on how transportation systems interact with micro-, meso- and macro-level factors, see Alam et al., 2022). These factors shape women's and men's mobility needs, and in turn affect equal access to employment, education, health, or leisure.

To measure gender inequalities in relation to transport and mobility, this paper first proposes a six-dimension conceptual framework that explains how gender affects mobility across these micro-, meso- and macro-levels, and that is subsequently used to inform the development of a measurement framework for the MGI. The framework examines how gender is a strong determinant of mobility patterns (modes, location, timings), the barriers women and men face in relation to mobility, then discusses gender in relation to the mobility infrastructure, as well as women's representation in the transport sector before outlining how these are framed by norms, policies, and perceptions at the societal level.

Figure 1: Dimensions informing the conceptual and measurement frameworks.



Source: authors' work.

2.1 Dimensions

Dimension 1: Gender and mobility patterns: modes, locations, timings
Gender is a strong determinant of mobility choice and constraint, particularly as it has a strong effect on travel patterns expressed in transport modes women and men use, locations they go to, and timings of their travel. While the report refers to women and men's differences in a general sense, there are certainly heterogeneous patterns within each group, and indeed other gender groups besides women and men.

- **Modes:** On average, based on the limited available data, women make a higher proportion of trips using public transportation and/or on foot. Percentages may differ depending on the level of private car and motorcycle use in the country, but this general pattern remains consistent in most of the countries where the data are available. By contrast, men make more trips by car, motorcycle, and bicycle. Women are more likely to use cheaper forms of public transport (buses may be cheaper than trains for example) (Duchène, 2011). However, to remain mobile, some women end up paying more than men for alternative forms of transport such as taxis and ride-sharing options, even though men on average have higher salaries and higher employment rates. On the other hand, men are more likely to be motorized and get access to private vehicles in households where their number is limited. Men are also more likely to use bicycles, as caring responsibilities prevent women with children from using cycling as a transportation mode (Shaw et al., 2020) in addition to cultural constraints as well as affordability and safety concerns that hold them back from cycling.

- **Locations:** Due to greater care responsibilities, women are more likely to make shorter trips, often for multiple purposes mirroring their multiple roles, for example, dropping children at school before travelling to a workplace, shopping, or health-related trips (Song et al., 2019;

Zhao et al., 2015), often referred to as "trip chaining." Trip chaining can be problematic in that it means reliance on a transport network that may not be able to respond to women's complex travel needs to access scattered locations leaving them spatially entrapped and time poorer and ultimately limiting their employment options. It also means that fare structures need to be able to cater to the need for women to make multiple stops without additional expense (Booth et al., 2000). Because of greater reliance on public transport, women are also more constrained in relation to their spatial reach, not only in the places they can access but how far they are able to travel.

- **Timings:** Timings when women and men tend to use transport are affected by care responsibilities, but also by concerns over safety and security and transport availability. Women are likely to avoid the use of public transport at night, or more likely to require transport in early or mid-afternoon for school pick-ups. Women are also more likely to avoid peak-times travel, where there are fewer services limiting their job opportunities and curtailing their freedom of movement.

Dimension 2: Gendered barriers to mobility

The transport related barriers to mobility from a gender lens have been summarized using the five broad (and sometimes overlapping) categories outlined in Box 1: availability, affordability, acceptability (social and cultural), accessibility (physical) and security and safety of public and private transport (Alam et al., 2022).

Box 1: gendered barriers to mobility

a. **Availability:** This refers to connectivity and coverage of the transportation system. In rural areas availability of transport infrastructure may be more salient than availability of transport services, while in urban areas transport services may be more salient. For people who own vehicles, availability of public transport may be less salient than people who don't own vehicles and rely on public transport to move around.
b. **Affordability:** This refers to travel costs and the extent to which people can afford to travel when and where they want. It includes both the direct (financial) cost, as well as, the opportunity cost of potential consumption that is foregone in exchange for mandatory trips. The same travel cost may be affordable for some people but not others.
c. **(Social and Cultural) Acceptability**: This refers to the quality of transportation infrastructure and user comfort and reliability. It also includes differing judgments, attitudes and behavioral reactions to women and men traveling and using various modes of transport. People travelling with children, or the elderly may view the comfort and reliability of the same transportation system differently than those travelling alone.
a. (**Physical) Accessibility**: This refers to the ease with which an individual can access opportunities (e.g., employment, health care, education, etc.). Able bodied people and people with disabilities may view the accessibility of the same transportation system differently.
b. **Safety and Security:** This refers to safety from crime and perception of security when using transportation systems.

Source: Alam et al. (2022, p. 15)

Availability: Availability can be gendered in that public transport systems may be under-developed though they are in greater demand from women than from men, overall. The locations at which transport is available may also not cater equally to women and men, due to their different mobility patterns in relation to locations and timings. Here whether transport options have adequate first- and last-mile connectivity is of particular importance affecting women and girls' mobility more than that of men and

boys. For example, often public transport either does not serve any internal routes in the communities, is only available at certain times – only during the daytime, for example – or the service is excessively infrequent. This results in women walking long distances or taking informal modes of transport to cover internal routes, which can be expensive and unsafe. A lack of evening transport also means that many women working in the services sector are less likely to take night-shift jobs (Kurshitashvili et al., 2021). Also, and importantly, limited availability of formal transport can push women towards using informal services, which tend to be inconsistent in their tariffs and schedules, bringing additional risk factors to women's safety and complicating their already complex travel (Dominguez Gonzalez et al., 2020).

Affordability: Women's access to economic resources is more limited than that of men, constraining women's affordability of transport. Furthermore, gendered mobility patterns can mean that women pay more such as when they trip chain or opt for different modes or timings to ensure their safety from gender-based violence. Because of the lower availability of reliable or safe transport, women can be left with having to pay for taxis or other forms of private transport. This has been termed the 'pink transport tax', which is a gender-based price discrimination – an extra amount that women as well as other categories of users such as older people or people with disabilities pay for transportation (Dandapat & Maitra, 2020; Mejía-Dorantes & Soto Villagrán, 2020). The 2018 study conducted by the New York University's Rudin Center for Transportation (Kaufman et al., 2018) found that in New York City the median monthly extra travel costs for women incurred for caretaking reasons reached up to US$50 more than their regular travel expenses, while men incurred zero additional costs. The same study also identified that safety concerns led women to modify their travel behaviors, which added another US$50 to their travel costs. Women are particularly affected by transport systems that charge flat rates per line or per journey and do not offer integrated fare systems. This is because as women travel multiple destinations within one trip, they often pay numerous single fare tickets during a chained trip.

Acceptability (Social and Cultural): Acceptability is related to the social and cultural barriers that women encounter when traveling. Societal attitudes – often shaped by religious or cultural norms – can constrain the *acceptability* of women's mobility. For example, family members, and in particular men, can discourage the use of transport options such a walking, cycling or public transport. This can be related to whether mobility is seen as appropriate and/or safe. In some countries where women's access to public transport or walking is low, driving or being driven become important prerequisites to participation to work, education, leisure, or access to health services (Kerzhner et al., 2018), which not only limits women's and girls' freedom of movement but hampers the efforts to decarbonize transport and accelerate energy transition. Where women increase their participation in work, education or leisure in the public sphere, mobility itself can be understood as a defiance to traditional gender norms (Neupane & Chesney-Lind, 2014), and punished as such.

Physical Accessibility: Women's transport options are hindered by accessibility, including factors such as long walking distances to stations or other terminals, which exacerbates existing concerns about safety and security. Access to transport can be hindered by gendered factors such as travelling with children and dealing with a pushchair where there is no step-free access, where transport is overcrowded.

Safety and personal security: Globally, real and perceived threats of gender-based violence – that is physical (including sexual) and verbal harassment – in transport and broadly in public space represent one of the biggest mobility barriers affecting women and girls, disproportionately more than it affects men and boys (Ball & Wesson, 2017; Freedman, 2002; Hickey, 2014; Horii & Burgess, 2012; Mungai & David, 2006). The most common forms of violence against women and girls on public transport range from leering, winking, and offensive gestures to unwanted touching/groping and pressing against women and girls as well as indecent exposure and assault. These transgressions are pervasive in different contexts. In some countries, sexual harassment is so widespread that women report being

accustomed to ‘routine groping’, though they remain concerned about possible escalation to more serious assaults (Mansoor & Hasan, 2016).

Safety concerns disproportionally impact women who have lower incomes. A qualitative study (Dominguez Gonzalez et al., 2020) on women’s mobility barriers conducted in three Latin American cities, Rio de Janeiro, Buenos Aires, and Lima, revealed that low-income women prioritized safety over affordability. If they could afford the costs, women were willing to pay more for transport modes that provided a greater sense of safety. In other focus groups in the same study, women who were economically worse off were not able to exert this choice even if it was their preference.

Women tend to adapt and/or constrain their mobility patterns to navigate lower safety and security whether these are real or perceived (Stark & Meschik, 2018). Factors that come into consideration are waiting times, transfer in isolated locations, avoiding journeys at certain times (anxious about safety at night) or levels of occupancy (Chowdhury, 2019). Women weigh up safety concerns with timings frequently, prioritizing the former over the latter (Shirgaokar, 2019). They are also more likely to use strategies such as traveling in groups, or taking more expensive modes of travel, as reported earlier, out of concerns for safety or even avoid travel altogether. Timings and locations create various degrees of exposure to violence, e.g., sexual harassment most prevalent in crowded rush hour (Hutson & Krueger, 2018; Lewis et al., 2021) as it offers perpetrators proximity and anonymity with little risk to be caught (Neupane & Chesney-Lind, 2014), but serious sexual assaults at times where women are more isolated.

Dimension 3: Gender and mobility infrastructure

Infrastructure: Women’s mobility challenges are often mistakenly understood to stem only from the design and operations of public transport service. In fact, they also concern the transport infrastructure and broader public space which shapes people’s decisions about if, when, how and when to travel affecting their travel patterns. For example, as women walk more and depend more on public transport, they are disproportionally impacted by the lack of broader public transport infrastructure, for instance, poor pedestrian pathways, a lack of street lighting or lighting at bus stops, or safe road crossings as well as generally inconvenient access to transport facilities. Consequently, this inadequate public transport infrastructure renders women’s daily journeys – which are already time-constrained in view of their multiple responsibilities – even more difficult.

For many women and girls though, the act of venturing into a public space – such as passing through a market or walking down a crowded or deserted street – produces anxiety and affects their perception of safety. To alleviate this anxiety, considerations such as safety, accessibility, comfort, and a sense of belonging to the community are equally as important to public safety as affordable and reliable public transport service. Ensuring a safe environment, is an integral part of creating more amendable door to door mobility experience. Some of the factors that create safety and comfort include good street lighting, easy to read signage, general visibility of the area, clear and well-kept paths, and mixed used areas (Kurshitashvili et al., 2021; Soraganvi, 2017).

Technology: Forms of on-demand transport such as bicycle sharing systems as well as demand-responsive public and private mobility services (picking up and dropping passengers in response to their needs without running a fixed schedule) have increased, enabled by technological developments. It is therefore both transport investment but also innovations that are shaping mobility. Transport infrastructure is shaped by the technological tools available to women and men, such as real time information or providing real-time bus information to not only improve service quality but also alleviate security concerns particularly among women. In recent years, mobile apps have played a key role in allowing users to determine the duration of waiting time. The use of artificial intelligence for transport services is also promising to respond to demand, and thus develop demand-responsive mobility services. However, it is important to consider the digital divide and that access to the internet and smart-

phone continues to be lower among women than men, constraining women's access to these l innovations (Singh, 2020). Smart mobility is therefore contingent, amongst others, on equalizing women's and men's access to and use of economic and financial resources, including bank accounts and payment cards (Masikini & Baruah, 2020).

Dimension 4: Gendered perceptions of transport
Assessing solely the nature of the transport infrastructure and services available paints only a partial picture of women's mobility: women's perceptions of comfort, price, availability, safety, and enjoyment from departure to the end of their journey reflect the performance of a transport network 'as a lived experience'. Perception issues can undermine any serious attempt to provide quality and accessible transportation infrastructure to women (Dominguez Gonzalez et al., 2020). Some studies show statistically significant differences in perception of safety of public transport and more broadly, public space among women and men significantly affecting mobility patterns and travel behaviours of women (Coppola & Silvestri, 2021; Polko & Kimic, 2021).

Women's perception of transport issues can fail to be captured in data, for reasons ranging from underreporting (Neupane & Chesney-Lind, 2014) to the lack of sex-disaggregated data. Nevertheless, a substantial strand of literature indicates significant gender differences: these studies mostly focus on urban spaces, and on gender perceptions of urban spaces and transport infrastructure (AitBihiOuali et al., 2019; Loukaitou-Sideris & Fink, 2008; Yavuz & Welch, 2010). They are helpful to understand the nature and extent of the barriers that impair women's social and economic inclusion. Nevertheless, most studies rely only on local data, and there is a scarce number of studies focusing on several countries or several continents.

Dimension 5: Women's representation in the transport sector
Gender can remain absent from transport policymaking especially when there is a low representation of women in the transport sector including as strategists, planners, or policymakers, but also as service providers. Women for example remain greatly under-represented in most of the customer front facing roles such as among bus and taxi drivers though women represent about half, if not more of their customer base. Though women's representation and involvement does not guarantee that gender perspectives will be addressed, it is nevertheless more likely that this will lead to a greater recognition and reflection of their needs in transport policymaking. Employing more women in the sector at all levels from boardroom to platform can lead to more gender-responsive transport service development by bringing women's perspectives to the decision-making table and by gender diversifying the transport service, which can influence the adoption of more gender-inclusive transport service and infrastructure planning, design, and operations. Of note is that many experts believe that only when women comprise 30 percent or more of an organization, they can start affecting change.

Dimension 6: Legal and policy frameworks
The decision of women to move for different purposes, including access to economic opportunities is influenced by gender norms and institutions that dictate if, when, where and how women and girls can or cannot move. These restrictive norms are often reinforced further by laws that discriminate based on gender, such as for example, laws in some countries that restrict women travelling in the same way as men. Transport policies can play a key role in combating gender inequalities by tackling discriminatory social norms and institutions that negatively impact on women's mobility and instead emphasize the benefits to society that can be gained by improving mobility for both women and men (Akyelken, 2013).

2.2 Data pre-processing and short-list of indicators

At the start of the data collection process, a review of existing data sources on mobility and gender has been undertaken. The full initial set of eligible data is presented in Table 3 in Appendix. This first set of eligible variables was then put through a list of selection criteria. The main principles underpinning the data selection process are listed below:

1. **Ensuring sufficient data quality:** The data potentially eligible to an inclusion into the final indicators was, for the most part, coming from open data sources published by reputable international institutions (e.g., OECD, World Bank, ILO). This choice was motivated by the necessity to ensure that the data collection would be peer-reviewed internally and documented externally and thus lead to variables meeting minimum data quality requirements.

2. **Principle of replicability:** The use of open-source data allows for a transparent replication of the measurements undertaken in this project. However, we also deemed necessary to allow for these indicators to be replicable also over time, and for more countries as wider data collections could be expected to be undertaken in future years.

On the basis of these main principles, several filters have been put in place to further select the variables.

- ***Filter 1: Geographic coverage*****:** since the aim of this research is to document *global* gender and mobility patterns, data which were not available for a sufficiently large number of countries were discarded. In many cases, the variables were only available for Europe (and the European Union countries more specifically). In the final set of variables, selected data are available for at least two regions, if not globally – with the exception of Dimension 3. Dimension 3 features two indicators which are available only for Europe and the collection was discontinued at the time of writing. These indicators measure the "Average absolute accessibility in urban areas (distance: 15mn/4km)" for two travel modes (walking and public transport). Given the relevance of these two indicators, the decision was made to retain and visualize these indicators on the dashboard to encourage future data collection with wider geographic coverage.

- ***Filter 2: Data periodicity and cut-off period***: All the variables obtained from data collection before 2018 were deemed ineligible and discarded from the analysis. The underlying assumptions behind this five-year data cut-off period is (i) a rapid increase in investment in transport infrastructure and services in recent years globally, and (ii) older data may not depict the reality of transport systems and individual mobility patterns. In most cases, eligible data are collected at a yearly frequency.

- ***Filter 3: Data availability***: Ensuring the future replicability of results is a central objective of this research. Therefore, open datasets have been prioritized to ensure that the data were collected following a transparent and documented process and that this data remain freely available in the years to come. However, the team was facing the necessity to include sex-disaggregated data, which was not available worldwide through open data sources, and the Gallup World Poll data was used as it was meeting all the other requirements with its worldwide geographic coverage, its yearly data collection frequency, and the provision of sex-disaggregated data. Three variables are used for indicators present in dimension 2 (Barriers) and dimension 4 (Perceptions).

- ***Filter 4: Redundant variables, the presence of alternatives and conceptual relevance***: Since the first selection of eligible variables, all eligible data have been further screened to test

whether there were better data alternatives and/or whether some variables were redundant with others in the present list.

  - ***Redundant variables***: The OECD variable measuring women's feeling of safety when walking alone at night, collected from the Better Life Index, was eliminated from the list of eligible variables. The Gallup World Poll's similar variable ("Do you feel safe walking alone at night in your community?") superseded the OECD variable since the former has worldwide geographical coverage.
  - ***Conceptual relevance:*** The variable of the World Bank's "Women, Business and the Law" index ("Is there legislation specifically addressing domestic violence?") which the team considered for the dimension 6 (policy and legal frameworks) was discarded due to its conceptual irrelevance to the phenomenon being measured.

Moreover, two other variables (Gallup World Poll's "In the city or area where you live, do you have confidence in the local police force?", and International Transport Forum's "Road Accident Fatalities") were dismissed from the analysis since they were deemed redundant with their dimension. The Gallup variable on the confidence towards the police was considered less relevant when it comes to gender and mobility compared to the self-rated feeling of safety whilst walking at night. Moreover, the road accident facilities number was more of a safety indicator, thus better suited for the Barriers section – however, it did not meet the sex-disaggregation requirement of that section, and had to be discarded as a result.

  - ***Presence of alternative variables***: The European Commission variable which contains information on the share of women employed in the transport sector (Dimension 5) was replaced with ILO data. The share of women employed in the transportation and storage sector (produced by ILO) superseded the European Commission variable with its worldwide geographic coverage and its yearly data collection frequency.

- ***Filter 5: Compatibility with theoretical framework requirements***: The conceptual framework has implications for the selection of relevant data, and whether or not dimensions require sex-disaggregated data. After a review, the following variables have been discarded:

  - ***Dimension 2: Gendered barriers to mobility***: This dimension requires data to be sex disaggregated. The variable of the World Bank's "Women, Business and the Law" index ("Can a woman travel outside her home in the same way as a man?") is not sex disaggregated. Thus, it was eliminated, and priority was given to another indicator available for women and men ("Do you feel safe walking alone at night in your community?").

- ***Filter 6: Statistical tests:*** Further data selection was undertaken afterwards to ensure that the statistical structure of the data was fit for aggregation at the dimension level. The statistical structure tests can be divided into two main types:
  - Directionality tests: Directionality should be maintained within each dimension for variables to be kept – i.e., the correlations should remain positive between variables at the dimension level.
  - Correlation tests: Variables are eliminated when the correlations are too high (i.e., >0.9).
- The main outcomes of the statistical tests led to the main eliminations for the reasons detailed below:
  - The average accessibility of driving variable ("Urban access – 15mn / 4km – Driving") was deleted since this variable is negatively correlated to the average accessibility of

walking variable and biking variable ("Urban access – 15mn / 4km – Walking", and ("Urban access – 15mn / 4km – Biking"). The average accessibility of driving variable is also uncorrelated to the average accessibility of public transport variable ("Urban access – 15mn / 4km – Public Transport"). The indicators focusing on walking and public transport have been prioritized over those related to the other transport modes due to their correlation and relevance to the sustainable mobility agenda.

- The variable on average accessibility of biking ("Urban access – 15mn / 4km – Biking") was dropped due to its high (>.9) correlation with the average accessibility of walking variable.

3 MEASUREMENT FRAMEWORK

The integrated database was used to develop a measurement framework. This was done following an iterative process, whereby the correlation structure of indicators within and across domains was examined and informed decisions on possible sets of indicators based on both conceptual and statistical considerations. The conceptual framework, measurement framework and the associated indicators are presented in Table 4 in Appendix. The table shows the extent to which it is possible to provide an empirical measurement of the conceptual framework, and therefore where there are (gender) data gaps.

3.1 Computation of scores

The construction of a composite indicator relies on the aggregation of different indicators. However, it is essential to ensure that these indicators are all interpreted in the same way (directionality) and are measured on the same scale (comparability). These two principles are used in the development of metrics, bound between 0 and 1, where the upper/lower bounds represent the best/worst situation relative to other countries for which data are available (though the arbitrary meaning given to them varies across existing indices, with some equating the best situation with 0 and other 1). These metrics allow for comparisons between different indicators and for further aggregation of these indicators into dimensions. The choice of metrics is not a simple one, and different choices have different implications. In this section, several approaches are reviewed – with examples from selected indices used as illustrations – to present the choices available for the Mobility and Gender Index.

3.1.1. Gap vs levels

Metrics can focus on measuring gaps or levels. The gender gap approach is the one taken by the World Economic Forum's Global Gender Gap Index. This index converts all indicators to gender ratios (W/M), as long as women's achievements remain lower than that of men's, and caps at 1 otherwise. The level approach can be seen in the construction of the UNDP's Gender Development Index. This index relies on the creation of dimension indices, computed separately for women and men, on the basis of the min-max procedure: $\text{minmax}_W = \frac{W - min_W}{max_W - min_W}$ and $\text{minmax}_M = \frac{M - min_M}{max_M - min_M}$, with W and M the mean values for women and men respectively. The minimum and maximum values are taken across countries in a given year. The min-max approach provides metrics that are much more easily interpretable, particularly for the purpose of policymaking, which relies on ensuring the higher possible level of achievement, while minimising gender gaps (Humbert & Hubert, 2021). The Europe Institute for Gender Equality's Gender Equality Index adopts a more complex metric, which seeks to adjust gender gaps using the relative position of a country. However, this approach has been criticized for making it difficult to communicate the part of the score that is attributable to gender gaps and to levels of achievement (Permanyer, 2015), and for the arbitrary allocation of importance given to gender gaps and levels of achievement in the calculation of the index (Humbert & Hubert, 2021).

As the Mobility and Gender Index aims to combine indicators that are sex-disaggregated with indicators that are not, it is not desirable to adopt a gender gap approach. Further, the gender gap approach is always problematic when used alone, as it fails to distinguish between a small gender gap where both women and men are doing badly from a small gender gap where women and men are performing well. Finally, whether a ratio or percentage point difference is adopted generates very different metrics, which are difficult to interpretate and communicate. This is illustrated in Table 1.

Table 1 - Examples of scores associated with different metrics

		Satisfaction with public transport infrastructure	W/M	$M - W$	minmax$_W$
Case 1	W	10%	0.5	0.1	0.1
	M	20%			
Case 2	W	40%	0.5	0.4	0.4
	M	80%			
Case 3	W	70%	0.875	0.1	0.7
	M	80%			
Case 4	W	1%	1	0	0.01
	M	1%			
Case 5	W	99%	1	0	0.99
	M	99%			

Note: Minmax calculated using theoretical min/max of 0/100, and $\text{minmax}_W = \frac{W - min_W}{max_W - min_W}$

3.1.2. Metric for the Mobility and Gender Index

The metric used to compute scores for the Mobility and Gender Index is provided below. This metric focuses on levels rather than gaps and is based on the minmax approach. An advantage of this metric is that it can used and interpreted in similar ways for indicators that are sex-disaggregated and for those that are not, and makes it possible to aggregate indicators that are disaggregated by sex or not.

For sex-disaggregated indicators, the harmonic mean is first computed between the levels for women and men. Second, the minimum and maximum across countries and wo/men are taken as the interval of reference, e.g., $min(W, M)$ and $max\,(W, M)$. The use of the harmonic mean penalizes gender inequalities that may exist, and is therefore a way to account for gender gaps while keeping the emphasis on levels. For example, in Table 5 in Appendix, countries A and D both have an average of 15%, but country A achieves a lower overall score because it has a wider gender gap (13% for country A, compared with 15% for country D). The same mechanism applies to countries C and E, showing that the approach is invariant to the level themselves. The interval used for the minmax is calculated across women and men to represent the potential convergence to the highest achievement for the max (e.g., women should aspire to the same level of achievement as men), while the min captures the relative lower position of women in society generally. Finally, the scores obtained are rescaled to ensure they fall on the interval 0 to 1.

For indicators that are not sex-disaggregated, the minmax is applied normally as: $\text{minmax}_X = \frac{X - min_X}{max_X - min_X}$, with X the mean of the variable. The only exception is when an indicator represents a share, in which case a cap is applied at 50%, e.g., the parity point, before applying the minmax transformation in the usual way. The computations associated with each type of indicators are summarized in Table 2.

Table 2 - Summary of steps applied to compute metrics

Non-disaggregated indicators	Sex-disaggregated indicators	Share of women
D1.1	D2.1	D5.1
D3.1	D4.1	
D3.2	D4.2	
Obtain min	Compute $H = \frac{2}{1/x_W + 1/x_M}$	Cap x_W at 50%
Obtain max	Obtain $min_{W,M}$	Obtain min_W
Compute $\frac{x - \min}{max - min}$	Obtain $max_{W,M}$	Obtain max_W
	Compute $\frac{H - min_{W,M}}{max_{W,M} - min_{W,M}}$	Compute $\frac{x_W - min_W}{max_W - min_W}$

3.2 Checking for outliers and data treatment

Applying these metrics provides the scores for each indicator, on an interval bound between 0 and 1. As per the recommendations of the European Commission's Competence Centre on Composite Indicators and Scoreboards (COIN), the scores are screened for outliers (Nardo et al., 2008), on the basis of the following criteria:

1. skew < |2|
2. kurtosis $<$ |3.5|

Where necessary, indicators are winsorized, e.g., extreme values are replaced by the next nearest value, until a given indicator falls within the criteria outlined above. Two of the indicators were treated: D1.1 and D3.2. In the first case, the values for Japan and Switzerland were replaced with the value for France. In the second case, the values for Greece, Romania and Spain were replaced with the value for Bulgaria. After treatment, the table of scores for each of indicator is provided in Table 6 in Appendix.

3.3 Aggregation and presentation of the scores

The aggregation within dimension is performed using the arithmetic mean. This means that full compensation between indicators is permitted. Different sets of indicators were considered, as per the shortlist of indicators. As part of an iterative process that involves checking the correlation structure for different solutions, the most appropriate set was retained. The scores for each dimension are provided in Table 7 in Appendix.

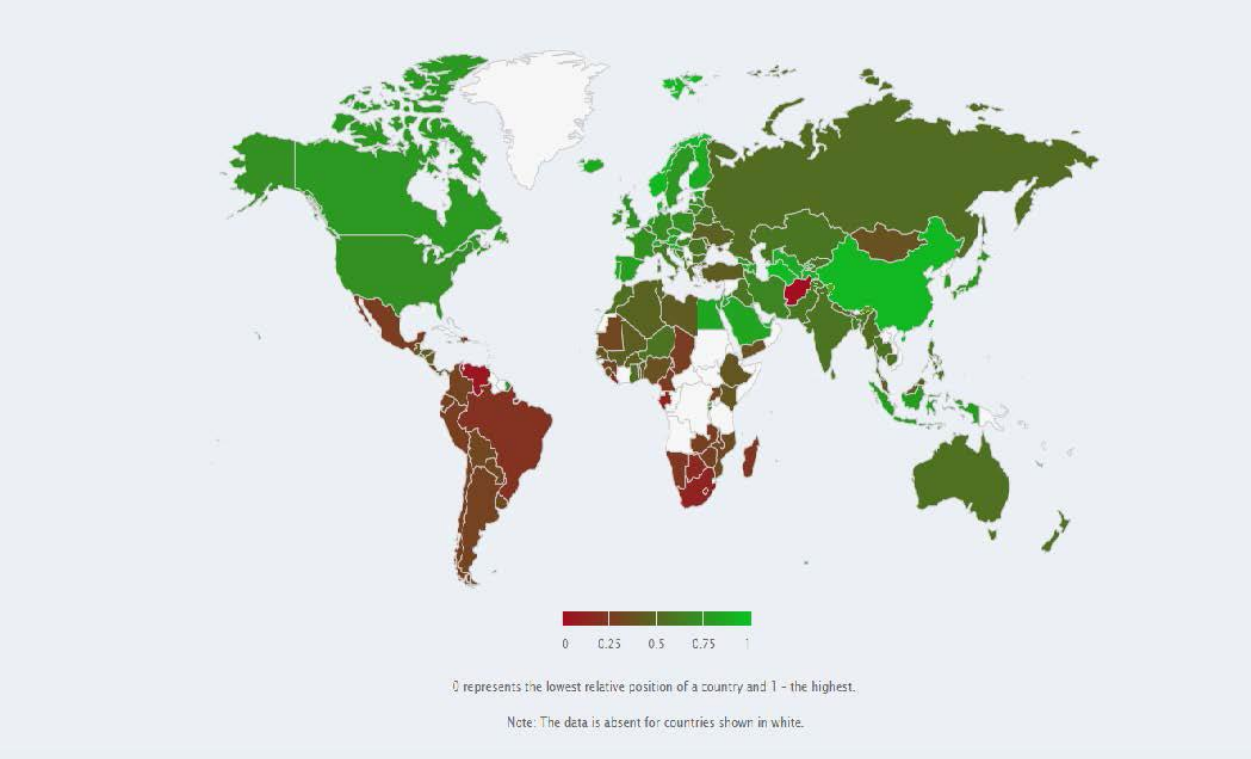
4 VISUALIZATIONS – PRELIMINARY FINDINGS

Despite the dearth of relevant data, some interesting findings emerge when data are visualized. This section provides a few heatmaps visualizing some of the dimension scores for illustration.

4.1 Dimension 2: Barriers

The "Barriers" dimension has severe data constraints with data available only for the *Safety and Personal Security* barrier (Gallup indicator "Individuals feeling safe walking alone at night in the city or area where they live"). Heatmap 1 below visualizes the scores for this dimension where 0 represents the lowest relative position of a country and 1 – the highest. Women globally face significant safety concerns in public space especially at night, albeit to different extent. Differences in country scores are evident, with Latin America, and the Caribbean and most of Sub-Saharan Africa performing worst. Better performers are in Europe and Central Asia, North America, China, the Middle East and North Africa. As with any global data, these scores need to be treated with caution when undertaking a more nuanced gender analysis at country level. For example, in some economies, social and cultural norms discourage or prohibit women from being in public space at night. Global data may not capture women's concerns about safety of walking at night in these geographies. The country averages also often mask variations in safety between densely populated metropolitan areas and rural places. Nevertheless, many of these findings are aligned with individual country reports available in these some of these geographies.

Heatmap 1 - Dimension 2: Gendered barriers to mobility

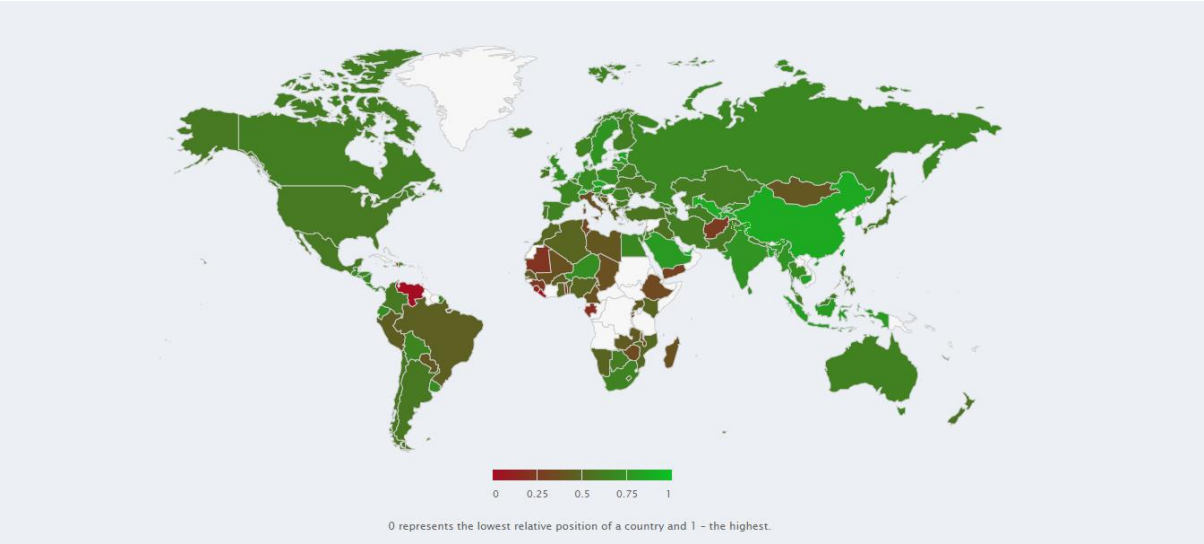


Source: Gallup's indicator "Individuals feeling safe walking alone at night in the city or area where they live". 2022. Data available for 144 countries. The visualization was done by the team.

4.2 Dimension 4: Gendered perceptions of mobility

Women's and men's perceptions of comfort, price, availability, safety, and enjoyment for the end-to-end journey can limit the use of an available transport network. Some studies show significant differences in the perception of safety of public transport and public space among women and men, shaping their mobility patterns and travel behaviours differently. Gallup's two sex-disaggregated indicators measure satisfaction with roads and highways and with public transport systems in areas where people live, and the associated scores visualized in Heatmap 2 show countries relative positions in this context, where 0 represents the lowest relative position of a country and 1 – the highest.

Heatmap 2 - Dimension 4: Gendered perceptions of mobility



Source: Gallup Indicators "Individuals satisfied with roads and highways in the area where they live, and "Individuals satisfied with public transport systems in the area where they live by sex". 2022. Data available for 145 countries. The visualization was done by the team.

4.3 Dimension 5. Women's representation in the transport sector.

Gender is often absent from transport policymaking, especially when there is a low representation of women in the transport sector in planning, policy, and operations. Women remain greatly under-represented in technical and managerial roles and in customer-facing roles such as bus and taxi drivers, though women represent at least half of the customer base. Though women's representation and involvement at all levels do not guarantee that gender perspectives will be addressed, it opens the sector to recognizing and reflecting on women's needs in transport policymaking and transport service development. The differences in women's employment are significant in all 121 countries for which data from the International Labor Organization (ILO) are available, although there are wide variations among countries. Regions with the lowest levels of women's employment in the transport and storage sector include the Middle East and North Africa (MENA), Sub-Saharan Africa, South Asia and the Latin America and the Caribbean. Heatmap 3 below presents relative scores for women's representation in the transport sector worldwide, where 0 represents the lowest relative position of a country and 1 – the highest.

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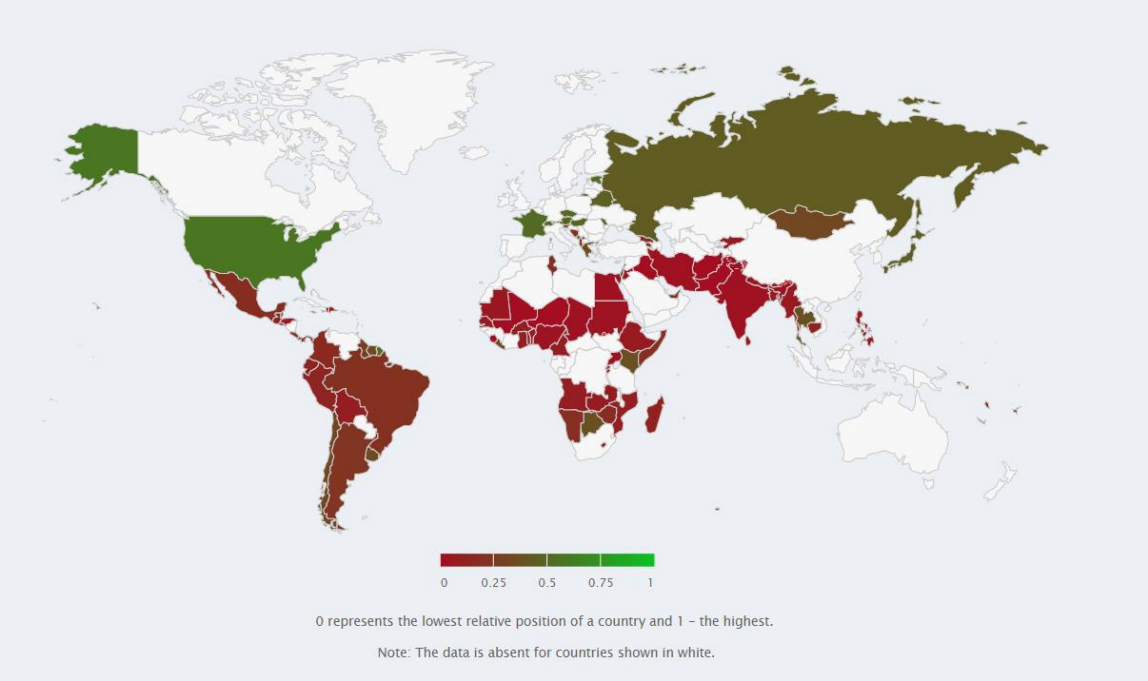
Heatmap 3 - Dimension 5: Women's representation in the transport sector



Source: ILO indicator "Share of women employed in transport and storage sector". 2022. Data available for 121 countries. The visualization was done by the team.

5 POLICY IMPLICATIONS

This research explored the feasibility of creating a Mobility and Gender Index (MGI). Based on this work, a number of policy implications have emerged:

- **What does not get measured, does not get done.** No global index tracks gender inequalities in mobility despite the growing evidence about development implications of gender inequalities in mobility. There is a wide range of global composite indicators that measure gender inequalities in other domains, such as health, education, economy, and civic participation (e.g., OECD's Social Indicators and Gender Index, World Economic Forum's Global Gender Gap Index, UNDP's Gender Inequality Index and EIGE's Gender Equality Index).

- **The chicken and egg situation:** The lack of sex-disaggregated mobility data and lack of awareness of the importance of addressing these gaps reinforce each other in a vicious cycle: the former does not allow for creating a mobility and gender index whilst the latter does not create sense of urgency for investing in improved data collection. The lack of a global index prevents policy makers and development agencies from drawing attention to this issue, setting project, program and policy priorities, and benchmarking and monitoring performance.

- **Need for more and better sex-disaggregated mobility data:** The data gaps signify that existing policies may not adequately address gender inequalities in mobility. Recognizing these gaps in current data, there should be a focus on improving both the quality and quantity of data collected. This may involve developing new survey instruments and/or modifying existing ones to better capture gendered experiences of mobility (within World Bank teams) as well as seeking external partnerships to collect data on gender differences in mobility. Some of the areas that the team will be exploring is how to use 'Big data', such as satellite data and how to amend household survey tools to fill in some of the data gaps in this area.

- **Potential for an index**: Due to data limitations, an index measuring gender inequalities in mobility cannot be computed with the available open-source data. However, this research showed that it is possible to construct scores for select dimensions and to visualize some of the gender gaps in the area of mobility. This preliminary research can be used as a foundation to ignite a discussion towards data collection and to finalize the construction of the MGI.

- **Public Awareness, Advocacy and Collaborations:** Policy initiatives should also include efforts to raise public awareness about the importance of gender equality in mobility and the benefits it brings in general, and about the importance of collecting more and better gender and mobility data, in particular. This might involve campaigns, educational programs, and various collaborations among donors, international and regional development organizations, policymakers, national statistical offices, non-profit organizations, and private sector players to share best practices, insights, and technical expertise in promoting gender-inclusive mobility.

In conclusion, the development of the MGI will be an important step towards understanding and addressing gender inequalities in mobility. As the current product is hopefully further developed into an index, it will provide policymakers with a tool to help guide their actions and monitor progress creating more inclusive and sustainable mobility. However, further work is needed to improve data collection, increase resource allocation, and promote collaboration and awareness.

6 CONCLUDING REMARKS AND NEXT STEPS

This technical report has presented the key findings of the exploratory research of the World Bank's Transport GP to construct a Mobility and Gender Index (MGI). The chapter 2 emphasized a feminist perspective to understand gendered geographies of mobility and highlighted the importance of considering factors intersecting with gender; proposed a six-dimension theoretical framework for the index and outlined data pre-processing and indicator selection steps followed for the dimensions. Existing data sources were reviewed, and selection criteria ensured data quality and replicability. Variables were filtered based on the geographic coverage, periodicity, availability, redundancy, and compatibility. Statistical tests were used to ensure data integrity. Informed by the findings of the chapter 2, chapter 3 detailed technical steps followed in developing the measurement framework for the MGI. Different approaches for measuring gender gaps and levels were explored, and possible aggregation within dimensions and scores were presented. Lastly, the report provided visualizations –by translating some of the dimension scores into heatmaps, and shared key findings of the displayed visuals.

The report acknowledges data gaps, uneven geographical coverage, and limitations, and outline the following next steps for the Mobility and Gender Index:

1. **Data Enhancement**: there is a need to address the significant gender data gaps to enable a more comprehensive measurement of gendered aspects of mobility through an index. This may involve collecting additional data and improving the geographical coverage in each dimension.
2. **Refinement of Indicators**: work focusing on continuously reviewing and updating the selected indicators is needed, together with attempting to identifying new indicators as they emerge or alternatively modifying existing ones to ensure they accurately capture gender and mobility-related aspects.
3. **Methodological Improvements**: Exploring alternative methods and approaches for computing scores and aggregating indicators to enhance the accuracy and robustness of the index. This may include refining the chosen metric, considering different weighting schemes, or incorporating additional statistical considerations.
4. **Stakeholder Engagement**: Engaging with relevant stakeholders, policymakers, and experts to gather feedback on the proposed index, discuss its implications, and explore potential applications for policymaking and gender-responsive interventions.
5. **Publication and Dissemination**: Sharing the findings, methodology, and scores of the Gender Index through reports, academic publications, or other communication channels to raise awareness, encourage discussions, and promote further research in the field.

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8 APPENDIX

Table 3 - Selection process summary for eligible variables potentially included in the MGI

Dimension 1: Gender and mobility patterns: modes, locations, timings					
Source	**Variable**	**Latest year(s) available**	**Sex-disaggregated**	**Available for non-European countries**	**Decision Post Screening**
Modes					
Eurostat	Total rail passengers	2004-2019	No	Yes	Limited geographical coverage
Eurostat	Rail passenger-km	2004-2019	No	Yes	Limited geographical coverage
International Transport Forum	Rail passengers	2020	No	Yes	Kept in the final version
International Transport Forum	Road accident fatalities	2020	No	Yes	Relevance
OECD	Total inland passenger transport (passenger-km)	2000-2019	No	Yes	Limited geographical coverage
WB Urban Transport Data Analysis Tool	Daily public transport boardings (million) – Standard Bus / Regional Rail / Metro / LRT / Tram / BRT	2014	No	Yes	Data discontinued and last year available pre-cut-off date
WB Urban Transport Data Analysis Tool	Registered private vehicles and registered two-wheelers – Total number of registered motor vehicles (Private, Total)	2014	No	Yes	Data discontinued and last year available pre-cut-off date
WB Urban Transport Data Analysis Tool	Share of trips to work by car / by motorcycle / bicycle/ by bus / by foot / by rail	2014	No	Yes	Data discontinued and last year available pre cut-off date
Locations / Timings					
WB Urban Transport Data Analysis Tool	Average trip length by car (km)	2014	No	Yes	Data discontinued and last year available pre cut-off date
WB Urban Transport Data Analysis Tool	Average journey time (minutes)	2014	No	Yes	Data discontinued and last year available pre cut-off date
WB Urban Transport Data Analysis Tool	Average duration of journey to work (minutes)	2014	No	Yes	Data discontinued and last year available pre cut-off date

Dimension 2: Gendered barriers to mobility					
Source	**Variable**	**Latest year(s) available**	**Sex-disaggregated**	**Available for non-European countries**	**Decision Post Screening**
Accessibility					
NO DATA					
Availability					
NO DATA					
Affordability					
ILO	Average monthly earnings of prime-age employees by sex, household type and presence of children (local currency)	2021	Yes	Yes	Did not pass the statistical tests
UN Women	Women with account at financial institution or with mobile money-service provider (% of female population aged 15 and older)	2017	Yes	Yes	Data discontinued and last year available pre cut-off date
Acceptability					
WBL	Can a woman travel outside her home in the same way as a man?	2020	N/A	Yes	Compatibility issues: Data are not sex-disaggregated – yet this is required for this dimension
Safety					
NO DATA					
Personal Security					
OECD	Feeling Safe Walking alone at night	2019	Yes	Yes	Redundant variable (Gallup data covers the same question with wider geographical coverage)
Gallup Data	Do you feel safe walking alone at night in your community? (WP113)	2022	Yes	Yes	Kept in the final version
Gallup Data	In the city or area where you live, do you have confidence in the local police force? (WP112)	2022	Yes	Yes	Relevance

Dimension 3: Gender and mobility infrastructure					
Source	**Variable**	**Latest year(s) available**	**Sex-disaggregated**	**Available for non-European countries**	**Decision Post Screening**
OECD	Urban access – 15mn / 4km – Driving	2018	N/A	No	Did not pass statistical tests
OECD	Urban access – 15mn / 4km – Walking	2018	N/A	No	Kept in the final version
OECD	Urban access – 15mn / 4km – Biking	2018	N/A	No	Did not pass statistical tests
OECD	Urban access – 15mn / 4km – Public Transport	2018	N/A	No	Kept in the final version
UNECE	Road Infrastructure at 31 December by Type of Road, Country and Year	1993-2019	N/A	Yes	Limited geographical coverage
WB Urban Transport Data Analysis Tool	Size of network – Length of transit – Bus / Metro / Tram / Light Rail -	2014	N/A	Yes	Data discontinued and last year available pre cut-off date
WB Urban Transport Data Analysis Tool	Number of stations – Regional Rail/Commuter Rail / Metro Rail / Light Rail / Tram / Trolley Bus / BRT	2014	N/A	Yes	Data discontinued and last year available pre cut-off date
WB Urban Transport Data Analysis Tool	Peak Time fares for 10 km of journey by transport mode (Local currency) – Metro / Bus / Regional Rail / LRT / Tram / BRT	2014	N/A	Yes	Data discontinued and last year available pre cut-off date
WB Urban Transport Data Analysis Tool	(i) PT Fare as share of Income = Average fare for 10km*40*12/per capita GDP ; (ii) MT Fare as share of Income = Average fare for 10km*40*12/per capita GDP ; (iii) MT Fare for avg. trip length as share of minimum daily wage	2014	N/A	Yes	Data discontinued and last year available pre cut-off date

Dimension 4: Gendered perceptions of transport					
Source	**Variable**	**Latest year(s) available**	**Sex-disaggregated**	**Available for non-European countries**	**Decision Post Screening**
World Values Survey	Degree of satisfaction (city/area where you live): The public transportation systems : Very satisfied – Fairly satisfied – Fairly dissatisfied – Very dissatisfied	2010-2014	Yes	Yes	Data discontinued and last year available pre cut-off date
Gallup Data	In the city or area where you live, are you satisfied or dissatisfied with the roads and highways? (WP91)	2022	Yes	Yes	Kept in the final version
Gallup Data	In the city or area where you live, are you satisfied or dissatisfied with the public transportation systems? (WP92)	2022	Yes	Yes	Kept in the final version

Dimension 5: Women's representation in the sector					
Source	**Variable**	**Latest year(s) available**	**Sex-disaggregated**	**Available for non-European countries**	**Decision Post Screening**
European Commission	Share of women employed in transport sector	2013-2017	N/A	No	Redundant variable – Replaced with ILO data with better geographic coverage and higher data collection frequency

Dimension 6: Legal and policy frameworks					
Source	**Variable**	**Latest year(s) available**	**Sex-disaggregated**	**Available for non-European countries**	**Decision Post Screening**
WBL	Is there legislation specifically addressing domestic violence?	2020	N/A	Yes	Relevance
SIGI	Presence of legislation against harassment	2012	N/A	Yes	Data discontinued and last year available pre-cut-off date

Table 4 - Conceptual framework, measurement framework and indicators

Conceptual framework		**Measurement framework**		
Domains	**Subdomains**	**Domains**	**Indicators**	**Sex-disaggregation**
Modes, locations and timings		Modes	Passengers Carried (million Passenger-kms, rail)	No
Barriers to mobility	Availability			
	Affordability			
	(Social and Cultural) Acceptability			
	(Physical) Accessibility			
	Safety and Security	Safety and security	Individuals feeling safe walking alone at night in the city or area where they live by sex	Yes
Infrastructure		Infrastructure	Average absolute accessibility in urban areas (distance: 15mn/4km). Mode: Walking Average absolute accessibility in urban areas (distance: 15mn/4km). Mode: Public Transport	No
Perceptions		Perceptions	Individuals satisfied with roads and highways in the area where they live by sex Individuals satisfied with public transportation systems in the area where they live by sex	Yes
Women's representation in the transport sector		Women's representation	Women's representation in the transportation and storage sector	Yes
Legal and policy framework				

Table 5 - Examples of scores for sex-disaggregated indicators using the modified minmax approach

		Min across countries	Max across countries	Minmax
	Country A			
Women	10%	5%	80%	0.07
Men	20%	15%	90%	0.07
Metric	13%	5%	90%	0.10
	Country B			
Women	50%	5%	80%	0.60
Men	70%	15%	90%	0.73
Metric	58%	5%	90%	0.63
	Country C			
Women	70%	5%	80%	0.87
Men	90%	15%	90%	1.00
Metric	79%	5%	90%	0.87
	Country D			
Women	15%	5%	80%	0.13
Men	15%	15%	90%	0.00
Metric	15%	5%	90%	0.12
	Country E			
Women	80%	5%	80%	1.00
Men	80%	15%	90%	0.87
Metric	80%	5%	90%	0.88
	Country F			
Women	70%	5%	80%	0.87
Men	50%	15%	90%	0.47
Metric	58%	5%	90%	0.63
	Country G			
Women	80%	5%	80%	1.00
Men	90%	15%	90%	1.00
Metric	85%	5%	90%	0.94
	Country H			
Women	5%	5%	80%	0.00
Men	15%	15%	90%	0.00
Metric	8%	5%	90%	0.03

Table 6 - Scores for indicators (after treatment)

	D1.1	D2.1	D3.1	D3.2	D4.1	D4.2	D5.1
Afghanistan		0.00			0.25	0.27	0.00
Albania	0.00	0.62			0.53	0.49	0.22
Algeria		0.48			0.52	0.45	
American Samoa							
Andorra							
Angola							0.09
Antigua and Barbuda							
Argentina		0.30			0.60	0.58	0.22
Armenia		0.91			0.52	0.49	0.23
Aruba							
Australia		0.55			0.62	0.67	
Austria		0.83	0.37	1.00	0.75	0.76	0.49
Azerbaijan	0.01	0.84			0.63	0.66	
Bahamas, The							
Bahrain					0.84	0.81	
Bangladesh		0.63			0.85	0.79	0.08
Barbados							0.43
Belarus		0.57			0.63	0.63	0.47
Belgium		0.58	0.34	0.31	0.61	0.65	
Belize							0.29
Benin		0.42			0.50	0.41	0.05
Bermuda							
Bhutan							0.11
Bolivia		0.33			0.68	0.65	0.09
Bosnia and Herzegovina		0.65			0.41	0.41	0.20
Botswana		0.16			0.58	0.64	0.37
Brazil		0.21			0.45	0.48	0.20
British Virgin Islands							
Brunei Darussalam							0.72
Bulgaria	0.18	0.54	1.00		0.61	0.60	
Burkina Faso		0.45			0.47	0.43	0.09
Burundi		0.59			0.36	0.29	0.00
Cabo Verde							0.32
Cambodia		0.56			0.86	0.80	0.12
Cameroon		0.26			0.41	0.35	0.09
Canada		0.77			0.61	0.64	
Cayman Islands							
Central African Republic							
Chad		0.27			0.42	0.32	0.03
Channel Islands							
Chile	0.03	0.29			0.57	0.61	0.33
China		0.94			0.86	0.86	
Colombia		0.31			0.61	0.56	0.16
Comoros		0.65			0.56	0.46	0.10
Congo, Dem. Rep.		0.28			0.39	0.34	1.00
Congo, Rep.							

Costa Rica		0.31			0.73	0.76	0.27
Côte d'Ivoire		0.33			0.42	0.36	0.02
Croatia	0.14	0.82	0.40		0.50	0.47	
Cuba							
Curacao							
Cyprus		0.66	0.09		0.42	0.44	0.66
Czech Republic	0.66	0.76	0.34	0.32	0.86	0.87	0.51
Denmark	0.79	0.89	0.47	0.27	0.71	0.72	
Djibouti							
Dominica							
Dominican Republic		0.21			0.65	0.70	0.08
Ecuador		0.28			0.71	0.72	0.13
Egypt		0.84			0.69	0.67	0.03
El Salvador		0.48			0.77	0.74	0.13
Equatorial Guinea							
Eritrea							
Estonia	0.22	0.81	0.46	0.22	0.85	0.85	0.52
Eswatini		0.26			0.64	0.63	0.49
Ethiopia		0.41			0.41	0.26	0.07
Faroe Islands							
Fiji							0.18
Finland	0.53	0.87	0.24	0.21	0.63	0.63	
France	1.00	0.73	0.41	0.28	0.67	0.67	0.52
French Polynesia							
Gabon		0.13			0.21	0.18	
Gambia		0.29			0.38	0.34	0.12
Georgia		0.79			0.70	0.70	0.20
Germany	0.69	0.71	0.27	0.18	0.69	0.71	
Ghana		0.55			0.51	0.48	0.09
Gibraltar							
Greece	0.06	0.52	1.00	0.39	0.47	0.48	0.35
Greenland							
Grenada							
Guam							
Guatemala		0.42			0.73	0.70	0.12
Guinea		0.32			0.27	0.21	
Guinea-Bissau							1.00
Guyana							0.28
Haiti		0.36			0.18	0.13	0.00
Honduras		0.45			0.71	0.70	0.05
Hong Kong		0.75			0.83	0.89	
Hungary	0.57	0.68	0.58	0.83	0.71	0.73	0.49
Iceland		0.85			0.57	0.64	
India		0.57			0.74	0.76	0.03
Indonesia		0.79			0.82	0.76	
Iran		0.66			0.66	0.61	0.03
Iraq		0.58			0.60	0.51	0.00
Ireland	0.17	0.70	0.16	0.12	0.58	0.58	
Isle of Man							

Israel		0.75			0.63	0.63	0.36
Italy	0.47	0.61	0.72	0.35	0.35	0.41	
Jamaica		0.60			0.67	0.72	0.30
Japan	1.00	0.77			0.57	0.61	0.46
Jordan		0.80			0.67	0.59	0.06
Kazakhstan		0.58			0.60	0.62	
Kenya		0.41			0.48	0.50	0.38
Kiribati							0.53
Kosovo		0.75			0.66	0.59	0.17
Kuwait		0.91			0.76	0.80	
Kyrgyzstan		0.57			0.70	0.70	0.07
Lao PDR		0.53			0.85	0.78	0.20
Latvia	0.19	0.67	0.53	0.18	0.78	0.77	
Lebanon		0.39			0.34	0.27	0.09
Lesotho		0.14			0.53	0.54	0.09
Liberia		0.18			0.02	0.01	0.31
Libya		0.44			0.43	0.38	
Liechtenstein							
Lithuania	0.12	0.69	0.54	0.20	0.67	0.70	
Luxembourg	0.48	0.85	0.00	0.00	0.81	0.82	
Macao SAR, China							
Madagascar		0.23			0.42	0.33	0.11
Malawi		0.29			0.35	0.32	
Malaysia		0.46			0.62	0.64	
Maldives							0.26
Mali		0.45			0.42	0.34	0.00
Malta		0.72	0.41		0.62	0.63	0.42
Marshall Islands							0.26
Mauritania		0.32			0.24	0.20	0.06
Mauritius		0.56			0.70	0.70	0.29
Mexico	0.00	0.27			0.60	0.60	0.18
Micronesia, Fed. Sts.							
Moldova	0.01	0.56			0.62	0.59	0.54
Monaco							
Mongolia		0.39			0.39	0.43	0.33
Montenegro	0.06	0.76			0.44	0.37	0.39
Morocco		0.55			0.51	0.50	
Mozambique		0.34			0.56	0.46	0.10
Myanmar		0.52			0.79	0.72	0.07
Namibia		0.24			0.46	0.50	0.19
Nauru							0.00
Nepal		0.49			0.73	0.61	0.05
Netherlands	0.55	0.81	0.48	0.24	0.76	0.83	
New Caledonia							0.60
New Zealand		0.55			0.53	0.59	
Nicaragua		0.42			0.69	0.71	
Niger		0.56			0.73	0.70	0.00
Nigeria		0.39			0.47	0.51	0.04
North Macedonia	0.01	0.66			0.50	0.47	0.24

Northern Mariana Islands							
Norway	0.30	0.95	0.24	0.32	0.65	0.65	
Oman							
Pakistan		0.59			0.62	0.58	0.00
Palau							0.87
Palestine		0.62			0.75	0.75	
Panama		0.40			0.67	0.69	0.22
Papua New Guinea							
Paraguay		0.32			0.42	0.40	
Peru		0.28			0.44	0.46	0.13
Philippines		0.57			0.61	0.60	0.08
Poland	0.42	0.72	0.53	0.35	0.71	0.72	
Portugal	0.28	0.85	0.46	0.43	0.58	0.62	
Puerto Rico							
Qatar							
Romania		0.58	1.00		0.66	0.65	
Russia		0.53			0.68	0.68	0.44
Rwanda		0.87			0.53	0.43	0.06
Samoa							0.20
San Marino							
São Tomé and Príncipe							
Saudi Arabia		0.84			0.84	0.71	
Senegal		0.40			0.43	0.41	0.07
Serbia	0.03	0.77			0.54	0.52	0.40
Seychelles							0.57
Sierra Leone		0.37			0.19	0.12	0.00
Singapore		1.00			1.00	1.00	0.49
Sint Maarten (Dutch part)							
Slovak Republic							
Slovenia	0.26	0.92	0.14	0.10	0.65	0.66	0.32
Solomon Islands							0.13
Somalia							0.19
South Africa		0.13			0.65	0.65	
South Korea		0.76			0.79	0.80	
South Sudan							
Spain	0.34	0.80	1.00	0.71	0.64	0.67	
Sri Lanka		0.58			0.70	0.63	0.07
St. Kitts and Nevis							
St. Lucia							
St. Martin (French part)							
St. Vincent and the Grenadines							
Sudan							0.04
Suriname							0.34
Sweden	0.78	0.77	0.33	0.14	0.75	0.74	
Switzerland	1.00	0.88	0.49	0.30	0.91	0.92	0.52
Syrian Arab Republic							
Tajikistan		0.91			0.85	0.87	
Tanzania		0.64			0.64	0.55	0.06
Thailand		0.56			0.74	0.69	0.38

Timor-Leste							1.00
Togo		0.40			0.22	0.19	0.06
Tonga							0.35
Trinidad and Tobago							0.24
Tunisia		0.49			0.34	0.29	0.20
Turkey	0.13	0.44			0.58	0.57	
Turkmenistan		0.95			0.63	0.63	
Turks and Caicos Islands							
Tuvalu							0.39
Uganda		0.34			0.45	0.39	0.02
Ukraine	0.28	0.47			0.60	0.58	
United Arab Emirates		0.95			0.92	0.91	0.23
United Kingdom		0.74	0.27	0.09	0.70	0.74	
United States	0.05	0.72			0.59	0.62	0.58
Uruguay		0.32			0.70	0.72	0.35
Uzbekistan		0.87			0.89	0.85	
Vanuatu							0.17
Venezuela		0.05			0.00	0.00	
Viet Nam		0.60			0.70	0.65	0.20
Virgin Islands (U.S.)							
Yemen		0.39			0.35	0.25	
Zambia		0.27			0.43	0.43	0.08
Zimbabwe		0.28			0.37	0.33	0.17

Table 7 - Scores for dimensions

	D1 – Modes	D2 – Barriers	D3 – Infrastructure	D4 – Perceptions	D5 – Context
Afghanistan		0.00		0.26	0.00
Albania	0.00	0.62		0.51	0.22
Algeria		0.48		0.49	
American Samoa					
Andorra					
Angola					0.09
Antigua and Barbuda					
Argentina		0.30		0.59	0.22
Armenia		0.91		0.51	0.23
Aruba					
Australia		0.55		0.64	
Austria		0.83	0.68	0.76	0.49
Azerbaijan	0.01	0.84		0.64	
Bahamas, The					
Bahrain				0.83	
Bangladesh		0.63		0.82	0.08
Barbados					0.43
Belarus		0.57		0.63	0.47
Belgium		0.58	0.33	0.63	
Belize					0.29

Benin		0.42		0.46	0.05
Bermuda					
Bhutan					0.11
Bolivia		0.33		0.66	0.09
Bosnia and Herzegovina		0.65		0.41	0.20
Botswana		0.16		0.61	0.37
Brazil		0.21		0.46	0.20
British Virgin Islands					
Brunei Darussalam					0.72
Bulgaria	0.18	0.54		0.61	
Burkina Faso		0.45		0.45	0.09
Burundi		0.59		0.32	0.00
Cabo Verde					0.32
Cambodia		0.56		0.83	0.12
Cameroon		0.26		0.38	0.09
Canada		0.77		0.63	
Cayman Islands					
Central African Republic					
Chad		0.27		0.37	0.03
Channel Islands					
Chile	0.03	0.29		0.59	0.33
China		0.94		0.86	
Colombia		0.31		0.59	0.16
Comoros		0.65		0.51	0.10
Congo, Dem. Rep.		0.28		0.37	1.00
Congo, Rep.					
Costa Rica		0.31		0.74	0.27
Côte d'Ivoire		0.33		0.39	0.02
Croatia	0.14	0.82		0.48	
Cuba					
Curacao					
Cyprus		0.66		0.43	0.66
Czech Republic	0.66	0.76	0.33	0.87	0.51
Denmark	0.79	0.89	0.37	0.72	
Djibouti					
Dominica					
Dominican Republic		0.21		0.67	0.08
Ecuador		0.28		0.71	0.13
Egypt		0.84		0.68	0.03
El Salvador		0.48		0.76	0.13
Equatorial Guinea					
Eritrea					
Estonia	0.22	0.81	0.34	0.85	0.52
Eswatini		0.26		0.64	0.49
Ethiopia		0.41		0.34	0.07
Faroe Islands					
Fiji					0.18
Finland	0.53	0.87	0.23	0.63	
France	1.00	0.73	0.34	0.67	0.52

French Polynesia					
Gabon		0.13		0.19	
Gambia		0.29		0.36	0.12
Georgia		0.79		0.70	0.20
Germany	0.69	0.71	0.22	0.70	
Ghana		0.55		0.49	0.09
Gibraltar					
Greece	0.06	0.52	0.69	0.48	0.35
Greenland					
Grenada					
Guam					
Guatemala		0.42		0.71	0.12
Guinea		0.32		0.24	
Guinea-Bissau					1.00
Guyana					0.28
Haiti		0.36		0.15	0.00
Honduras		0.45		0.70	0.05
Hong Kong		0.75		0.86	
Hungary	0.57	0.68	0.70	0.72	0.49
Iceland		0.85		0.61	
India		0.57		0.75	0.03
Indonesia		0.79		0.79	
Iran		0.66		0.63	0.03
Iraq		0.58		0.55	0.00
Ireland	0.17	0.70	0.14	0.58	
Isle of Man					
Israel		0.75		0.63	0.36
Italy	0.47	0.61	0.53	0.38	
Jamaica		0.60		0.69	0.30
Japan	1.00	0.77		0.59	0.46
Jordan		0.80		0.63	0.06
Kazakhstan		0.58		0.61	
Kenya		0.41		0.49	0.38
Kiribati					0.53
Kosovo		0.75		0.62	0.17
Kuwait		0.91		0.78	
Kyrgyzstan		0.57		0.70	0.07
Lao PDR		0.53		0.82	0.20
Latvia	0.19	0.67	0.35	0.77	
Lebanon		0.39		0.31	0.09
Lesotho		0.14		0.53	0.09
Liberia		0.18		0.02	0.31
Libya		0.44		0.41	
Liechtenstein					
Lithuania	0.12	0.69	0.37	0.69	
Luxembourg	0.48	0.85	0.00	0.82	
Macao SAR, China					
Madagascar		0.23		0.38	0.11
Malawi		0.29		0.34	

Malaysia		0.46		0.63	
Maldives					0.26
Mali		0.45		0.38	0.00
Malta		0.72		0.63	0.42
Marshall Islands					0.26
Mauritania		0.32		0.22	0.06
Mauritius		0.56		0.70	0.29
Mexico	0.00	0.27		0.60	0.18
Micronesia, Fed. Sts.					
Moldova	0.01	0.56		0.60	0.54
Monaco					
Mongolia		0.39		0.41	0.33
Montenegro	0.06	0.76		0.41	0.39
Morocco		0.55		0.50	
Mozambique		0.34		0.51	0.10
Myanmar		0.52		0.75	0.07
Namibia		0.24		0.48	0.19
Nauru					0.00
Nepal		0.49		0.67	0.05
Netherlands	0.55	0.81	0.36	0.80	
New Caledonia					0.60
New Zealand		0.55		0.56	
Nicaragua		0.42		0.70	
Niger		0.56		0.71	0.00
Nigeria		0.39		0.49	0.04
North Macedonia	0.01	0.66		0.48	0.24
Northern Mariana Islands					
Norway	0.30	0.95	0.28	0.65	
Oman					
Pakistan		0.59		0.60	0.00
Palau					0.87
Palestine		0.62		0.75	
Panama		0.40		0.68	0.22
Papua New Guinea					
Paraguay		0.32		0.41	
Peru		0.28		0.45	0.13
Philippines		0.57		0.61	0.08
Poland	0.42	0.72	0.44	0.71	
Portugal	0.28	0.85	0.45	0.60	
Puerto Rico					
Qatar					
Romania		0.58		0.65	
Russia		0.53		0.68	0.44
Rwanda		0.87		0.48	0.06
Samoa					0.20
San Marino					
São Tomé and Príncipe					
Saudi Arabia		0.84		0.78	
Senegal		0.40		0.42	0.07

Serbia	0.03	0.77		0.53	0.40
Seychelles					0.57
Sierra Leone		0.37		0.16	0.00
Singapore		1.00		1.00	0.49
Sint Maarten (Dutch part)					
Slovak Republic					
Slovenia	0.26	0.92	0.12	0.65	0.32
Solomon Islands					0.13
Somalia					0.19
South Africa		0.13		0.65	
South Korea		0.76		0.79	
South Sudan					
Spain	0.34	0.80	0.86	0.65	
Sri Lanka		0.58		0.67	0.07
St. Kitts and Nevis					
St. Lucia					
St. Martin (French part)					
St. Vincent and the Grenadines					
Sudan					0.04
Suriname					0.34
Sweden	0.78	0.77	0.24	0.74	
Switzerland	1.00	0.88	0.39	0.91	0.52
Syrian Arab Republic					
Tajikistan		0.91		0.86	
Tanzania		0.64		0.59	0.06
Thailand		0.56		0.71	0.38
Timor-Leste					1.00
Togo		0.40		0.21	0.06
Tonga					0.35
Trinidad and Tobago					0.24
Tunisia		0.49		0.32	0.20
Turkey	0.13	0.44		0.57	
Turkmenistan		0.95		0.63	
Turks and Caicos Islands					
Tuvalu					0.39
Uganda		0.34		0.42	0.02
Ukraine	0.28	0.47		0.59	
United Arab Emirates		0.95		0.92	0.23
United Kingdom		0.74	0.18	0.72	
United States	0.05	0.72		0.60	0.58
Uruguay		0.32		0.71	0.35
Uzbekistan		0.87		0.87	
Vanuatu					0.17
Venezuela		0.05		0.00	
Viet Nam		0.60		0.68	0.20
Virgin Islands (U.S.)					
Yemen		0.39		0.30	
Zambia		0.27		0.43	0.08

Zimbabwe	0.28	0.35	0.17