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Women, mobility, health and sustainability. A new paradigm in everyday mobility

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In the context of the current climate crisis, this article aims to highlight the main differences in women's behaviour, compared to men's, in terms of their mobility habits and the externalities deriving from them. They will be contextualised in relation to women's role in society (in the labour market, in family roles and in social relationships) and will be linked with structural gender inequalities. Finally, we will indicate some of the issues to be addressed from the perspective of mobility policies in Catalonia and the Barcelona Metropolitan Area.

1. Basic concepts regarding mobility's contribution to climate change and the deteriorating environmental quality of cities, with a gender perspective

With the economic reactivation that began in 2013, the emissions deriving from diffuse sectors like transport rose again, after a slow but steady decrease due to the economic crisis. Today, the mobility and transport sector is responsible for 32% of the greenhouse gases emitted in the province of Barcelona (2018), making it the biggest polluter after the industrial sector. In particular, land transport is responsible for 55% of NO₂ emissions and 59% of particulate matter that is harmful to health – such as PM₁₀ or PM_{2.5} – and for the increase of noise pollution in the towns and cities of the Barcelona Metropolitan Area.

It must be remembered that in the province of Barcelona, where some 20 million journeys take place daily – without counting long-distance or last-mile goods distribution – most of this mobility occurs through active mobility (like walking or cycling) or public transport. However, 7 million journeys (36% of the total) still take place in private motor vehicles, 57% of which run on diesel and 40% on petrol, with just 3% in alternative vehicles, such as electric or hybrid cars. This use of a private vehicle is clearly associated with a male profile. As we will see below, women have healthier and more sustainable mobility habits. Nonetheless, on some occasions, they suffer inequalities for this reason, particular when they are more affected by some of the externalities generated by the use of private motor vehicles.

The situation with regard to deteriorating environmental quality in the city of Barcelona has not changed substantially in recent years, and current forecasts indicate that it will not change in the medium or long term unless decisive actions are taken to respond to the requirements set by various bodies and institutions.

The European Union in particular has promoted initiatives, directives and regulations that establish various targets with a view to reducing emissions of these different local and global pollutants. Specifically: the 2016 Paris Agreement, the White Paper on Transport, the 2030 Agenda and Directive 2008/50/EC on air quality. The United Nations, meanwhile, has underlined the importance of minimising our impact on cities' air quality and the need to mitigate or adapt to the effects of climate change in its Sustainable Development Goals (SDG) 11 and 13, respectively. The WHO has also taken a stance, given the serious effect on health that exposure to these local and global pollutants can have.

However, the Catalan or metropolitan policies aimed at minimising the transport sector's impact on climate change, on environmental quality or noise pollution have not had the desired effect, unlike those in other sectors. Nonetheless, the situation in terms of sustainable mobility regulations and planning is much more optimistic here than in other regions. Broadly, difficulties in reaching inter-administration agreements to apply certain initiatives, often met with significant social protest from economic agents and certain pressure groups, are the reason behind the lack of substantial improvement seen in this area. Decision-making on this subject covers more than just specific mobility policies; it cuts through a host of other areas, such as the economy, work, welfare and social rights, tourism, urban planning, education and others.

It is particularly relevant to note that, in recent years, the gender perspective has started to be seen in the design of mobility and transport planning instruments, policies and initiatives, with a focus on women's better mobility habits and lesser impact on climate change, environmental quality, noise pollution and road accidents. However, at the same time, it is important to understand the causes behind this different behaviour compared to men and to avoid increased inequality on gender grounds in this area.

2. How can women's mobility be characterised and what elements explain it?

The Working Day Mobility Survey (EMEF by its initials in Catalan)¹ is the only existing source of information in the Barcelona Metropolitan Area that offers a snapshot of different behaviours in terms of day-to-day mobility habits among different population profiles. Below, there is a brief summary of the differing mobility characteristics of women living in the city of Barcelona and in the rest of the Barcelona Integrated Fare System area (hereinafter, IFS), based on data from the 2018 edition of the survey. Meanwhile, to provide a more intersectional perspective in keeping with their social diversity, aspects like age, employment situation, educational level and urban characteristics of the place of residence (household income, access to public transport, etc.) are taken into account. The information is accompanied by explanatory elements and other useful sources.

2.1. Immobility and degree of mobility

Some people report that they do not make any journeys over the course of a working day; in other words, they do not leave their home. Basically, they do not leave their home as they are unable to (due to illness, a disability, care duties, etc.) or for other work or personal reasons. The percentage of the population that is non-mobile tends to remain stable and has a clear structural bias according to sex. In 2018 in Barcelona, 7.8% of women were non-mobile, while the figure stood at 5.1% for men. One of the reasons for this difference is the higher proportion of women in the older population, which has an impact on health.

It must be noted that, although the ageing of the population is more pronounced in Barcelona than in the rest of the province, the degree of immobility is higher among women who live outside the city (up to almost 10% in the rest of the IFS). Therefore, older women in Barcelona lead a more active life in terms of mobility than the population outside the city. A priori, this could be associated with a healthier lifestyle among the older women of Barcelona, but it is difficult to confirm categorically, as physical activity and exercise may also take place in the private sphere. Other

1. For more information on this official statistical initiative, please visit <https://iermb.uab.cat/ca/enquestes/enquestes-de-mobilitat/>

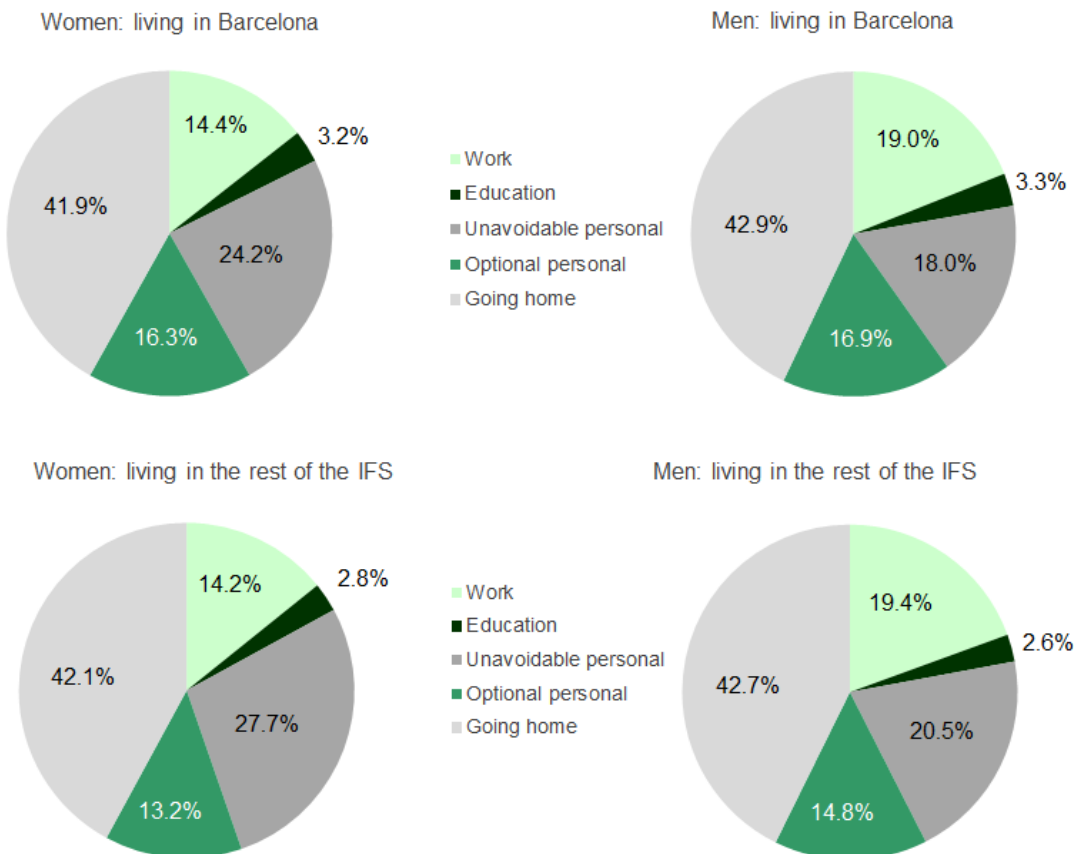
aspects relating to this different mobility should probably also be taken into account, such as the population's ability to travel in appropriate conditions.

As well as immobility, the number of journeys made by each person over the course of a working day is a relevant figure. The value is similar among men and women, in aggregate terms (in Barcelona, 4.17 for women, and 4.13 for men), but there are significant differences when socio-demographic profile is taken into account. For example, economically active women (employed or unemployed) are the group that makes more journeys over the course of the day, and therefore, they carry out more daily activities outside the home. This is a group of women whose use of time is complex; as well as journeys linked to work (if they are employed), many of their journeys are linked to domestic activities, childcare, or care of other dependent persons. The number of these other journeys tends to be higher among unemployed women.

2.2. Different reasons for journeys

The reasons for these day-to-day journeys clearly reflect the population's social uses of time, as well as being closely linked to age and employment situation. What is more, everyday routines differ according to sex, which is evident when we examine day-to-day mobility. Both in Barcelona and in the rest of the IFS, a clear pattern emerges: women make fewer journeys for work and more for personal reasons. Furthermore, within the sphere of personal mobility, women make more journeys for essential activities (unavoidable personal mobility), necessary as part of everyday life or for care duties, like going to the doctor's, accompanying other dependent persons or doing grocery shopping. At the same time, within other types of mobility that are more optional, there are differences in types of activity depending on sex. Men make more journeys for leisure purposes and go on more walks, while women make more journeys to visit family and shop for items other than groceries.

Graph 1. Distribution of journeys according to reason (aggregate). Residents of Barcelona and the rest of the IFS. 2018



Source: Produced using data from EMEF 2018 (ATM).

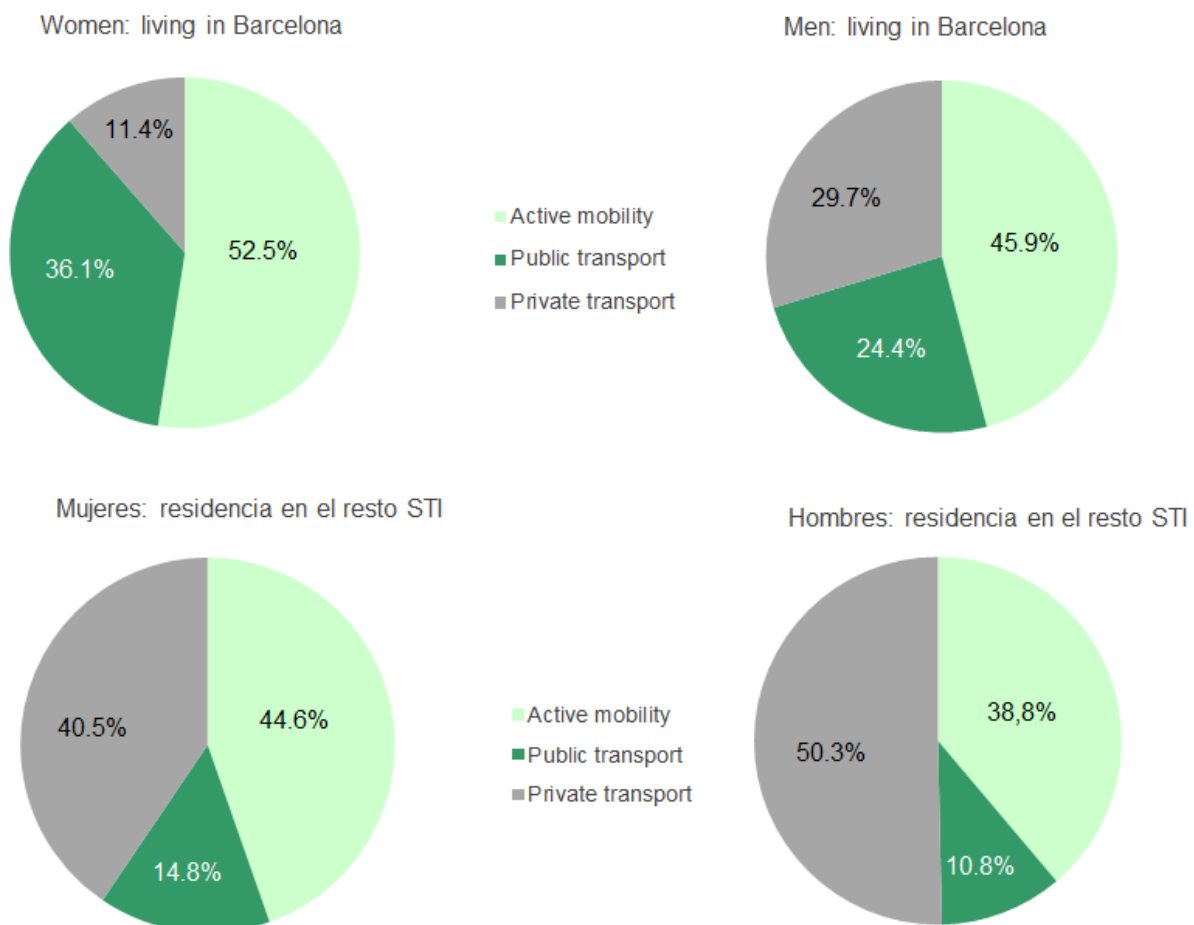
The origin of these differences is obvious and well known: the roles traditionally assigned to women are more intensely associated with care duties and contributing to maintaining human life. This higher degree of responsibility in domestic and family activities has an impact on many areas of life, which generates differences in everyday routines. For example, in 2011 in Catalonia, women dedicated twice as much time as men to the home and the family, while men dedicated 34% more time to paid labour and 42% more to hobbies and digital activities (Use of Time Survey 2011, Idescat). As well as generating more unavoidable personal journeys, women's unpaid labour has a negative impact on their participation in the labour market, and causes them to make fewer journeys for work reasons. It is worth noting that these differences are especially pronounced in the economically active population and in the population aged between 30 and 64, as everyday activities are similar among younger men and women. This reflects how gender inequality is closely linked to motherhood and the adoption of certain roles within the home.

2.3. Means of transport

As women carry out more activities associated with local travel, they tend to walk more. Although walking as a means of transport is also common among men, the use of a private vehicle is much more prevalent in the male population, especially when linked to work mobility (often related with longer distances). What is more, women make more journeys on public transport.

Particularly in Barcelona, although active mobility and use of public transport are common throughout all sections of the resident population, the percentage of women who use these means of transport is 88%, while the proportion of men is just 70%.

Graph 2. Distribution of journeys according to means of transport. Residents of Barcelona and the rest of the IFS. 2018



Source: Produced using data from EMEF 2018 (ATM).

However, the explanation behind this data goes far beyond women's lesser participation in the labour market. In the same age strata, employment situation, income and level of accessibility to public transport, women continue to have more sustainable mobility habits. For instance, although there are no notable differences among young men and women in terms of reasons for journeys, men between 16 and 29 and male students tend to choose a private vehicle more (50% of journeys made by female students in Barcelona take place on public transport, while this figure is just 43% among male students).

The following summarises some reasons for these differences in use of different means of transport:

- **Less need to use a private vehicle:** as we have seen, some of women's reasons for journeys are related to activities that, in our society, tend to be local; these journeys are therefore often made by active means of transport. What is more, in many cases, women choose jobs closer to home, to which they can easily walk. Therefore, the need to balance work with family life explains the fact that 81% of women who live in the Barcelona Metropolitan Area work in the municipality in which they live, compared to 65% of men. Furthermore, the jobs to which they have access (or the jobs they prioritise) tend to be located in urban locations where access on foot or via public transport is more viable (Urban Cohesion Survey, 2017).
- **Less access to a private vehicle:** the inequality generated by women's different participation in the labour market (more part-time work, more temporary contracts, less access to management positions, etc.) leads to less access to a private vehicle due to the lower income associated with precarious work, as well as perpetuating traditional feminine and masculine roles. When a woman's participation in generating household income is less than the man's, the man tends to use the private vehicle more habitually. In 2011, only in the 17% of households in the Metropolitan Area with just one private vehicle was the woman the one who used the car more often (ECVHP, 2011).

These two elements aside, it is important to consider the territorial component, as it helps us to understand certain mobility patterns through a gender perspective. In areas with lower population density with mainly residential functions or with a semi-rural dynamic in the IFS and, in general, in places where public transport is less accessible, private vehicles are much more common among women. Therefore, although men's and women's routines continue to differ, they use private vehicles almost equally – at a figure of up to 53% – in the outer zone of the IFS (see table 1). In these areas (and the outer areas of the conurbation of Barcelona), access to a private vehicle is particularly necessary for women, as not having one entails a significant loss of opportunities.

Table 1. Modal share of motorcycle and car according to zone of residence. 2018.

Zone of residence	Modal share motorcycle (%)		Modal share car (%)	
	Woman	Man	Woman	Man
Barcelona	3.1	10.3	8.2	18.0
Rest of zone 1	1.1	7.0	23.3	30.9
Rest of Barcelona Metropolitan Region	0.8	4.3	43.7	44.9
Rest of IFS	0.7	2.3	53.6	53.2

Source: Produced using data from EMEF 2018 (ATM).

In contrast, women living in denser areas present much healthier, more environmentally friendly mobility patterns. In Barcelona, for example, women make 11.4% of their journeys in a private vehicle, while this figure increases to 27.9% among men. However, this behaviour may be caused by inequality. Indeed, in many cases, urban pressure prevents households from owning more than one private vehicle (see table 2), and for cultural reasons associated with gender roles, it is often the man who uses it in his daily routine.

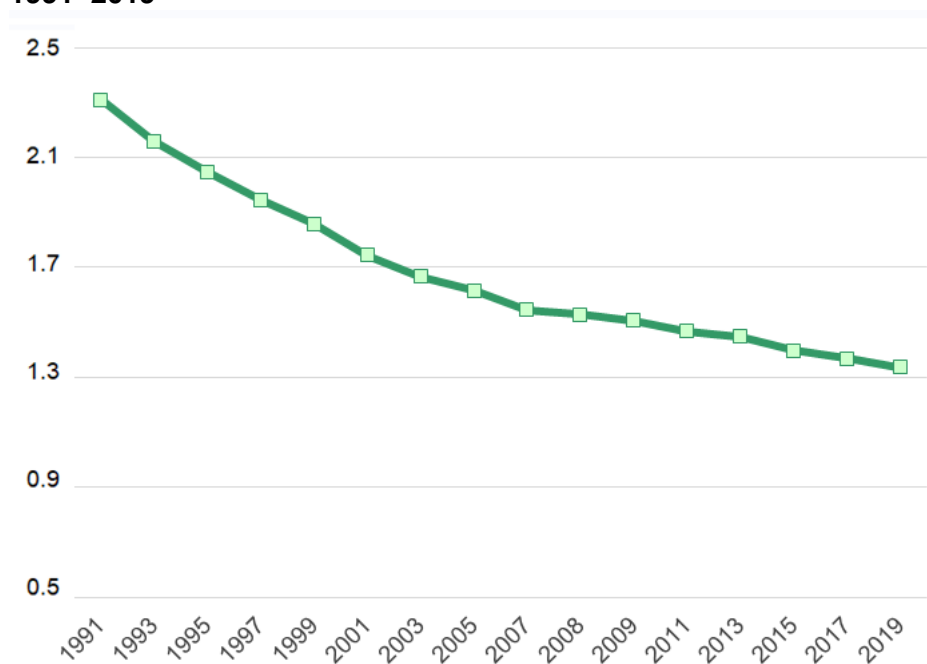
Table 2. Percentage of cars per household according to the number of inhabitants of the municipality of residence in the IFS and Barcelona. 2018.

Cars per household	Fewer than 5,000 inhabitants	5,000–20,000 inhabitants	20,000–50,000 inhabitants	Over 50,000 inhabitants (not including Barcelona)	Barcelona	Total IFS
No car	2.2	5.1	9.5	12.9	28.0	14.9
1 car	30.0	40.7	48.6	55.3	57.0	51.0
2 cars or more	67.8	54.2	41.8	31.8	15.1	34.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Produced using data from EMEF 2018 (ATM).

As for the evolution of this data over time, the EMEF’s time series has not shown a clear trend towards changing everyday mobility habits in women or men yet. Currently, most of the changes observed are associated with changes deriving from economic cycles (for example, during the 2009–2014 crisis, men’s mobility patterns were ‘feminised’). Nonetheless, it is true that the gap in access to a private vehicle is shrinking, as the percentage of men drivers registered in Spain is displaying a clear downward trend.

Graph 3. Proportion of men in the total number of driving licence holders in Spain. 1991–2019



Source: Produced using data from the Directorate-General for Traffic (DGT).

2.4. Preferences and predispositions

Year after year, the EMEF observes that our society values individual means of transport over public transport, and that there are no significant differences according to sex in this area. After walking and cycling, motorcycles and cars are the means of transport with the best rating every year. All public transport receives poorer ratings, though the tram obtains the best rating. Nonetheless, men rate some means of transport, like the motorcycle or the metro, more highly, probably because they offer a feeling of speed, which is something culturally more associated with masculinity. EMEF also notes that the preference for private transport is a common answer as a reason for not using public transport (between 8% and 10% of answers), with no significant differences between men and women.

Table 3. Satisfaction with means of transport. Residents of Barcelona and the rest of the IFS. 2018 (10 = very satisfied, 0 = very dissatisfied).

Means of transport	Barcelona		Rest of IFS	
	Woman	Man	Woman	Man
Walking	8.5	8.3	8.4	8.2
Bicycle	8.2	8.2	8.2	8.2
Scooter, segway, other personal transporters	7.3	7.4	7.6	8.1
Metro	6.8	7.2	6.9	6.9
TMB bus	7.0	7.0	6.9	6.8
Other urban bus	6.5	6.6	6.6	6.5
Interurban bus	6.6	6.7	6.8	6.6
Tram	7.4	7.3	7.5	7.2
Renfe Rodalies (local train)	6.3	6.2	6.4	6.3
Regional/mid-distance Renfe train	6.4	6.3	6.9	6.4
Taxi/Uber/Cabify	6.6	6.6	6.7	6.4
Car (driver)	7.3	7.1	7.8	7.7
Car (passenger)	7.7	6.9	8.0	6.9
Motorcycle	7.9	8.1	7.7	8.3
Public transport	7.0	7.0	6.9	6.8

Source: Produced using data from EMEF 2018 (ATM).

This data highlights the preference for private vehicles throughout the population. Factors behind this include freedom of movement, time flexibility, physical privacy and social status. The lack of significant difference according to sex also emphasises how, in the current context of the climate emergency, both men and women continue to favour private motorised mobility over public transport.

3. Can the current mobility model accentuate situations of gender inequality?

As we have seen, women's more sustainable, healthier mobility habits can largely be explained by the structural gender inequality that persists and is highly evident in our everyday lives. In addition, we have examined how the urban model and the accessibility of public transport, as well as the construction of the urban public space, contribute towards shaping women's day-to-day mobility patterns and generate differences according to gender. The following paragraphs will briefly express the extent to which the female mobility model, which is much more adapted to the context of a climate emergency, helps to perpetuate or exacerbate inequalities between men and women.

First, it is important to highlight women's different contribution to climate change and to the deterioration of air quality in urban areas. Despite being just as exposed to air pollution and the risks associated with climate change, they contribute to them less than men. A preliminary study (IERMB, 2017) gave an estimation of the impact of everyday mobility among the residents of the AMB's municipalities according to sociodemographic profile. The results showed that, in all age groups, women's mobility contributes less to climate change (energy consumption and CO₂ emissions) and to worsening air quality (NO_x and PM₁₀ emissions). They highlighted the disadvantage suffered by women and other groups who mainly travel using active transport or use public transport more (children and young people, elderly people, people with a lower income, etc.): they contribute less, but they are still affected by all the impacts of climate change.

In parallel to the health impacts generated by noise pollution deriving from motor traffic (which probably displays a similar pattern to that of pollutant emissions, in terms of gender differences), another unwanted effect of mobility must be considered: road traffic injuries. It is true that, in this case, the number of deaths and serious injuries is much higher among men, as more men drive than women. Nonetheless, some recent studies on the risk of road accidents in the city of Barcelona indicate that more men are responsible for traffic accidents, and more women are involved as pedestrians or passengers.

Apart from the health impact, the mobility system generates a host of externalities that affect women's everyday lives. These include inequality in terms of territorial accessibility, as lack of access to a private vehicle may limit women's ability to access the whole territory, thus shrinking

their territorial reference framework even further. As a result, when the distances to be travelled cannot be covered through active means of transport and public transport services are insufficient, women who do not have a driving licence or a vehicle may be restricted in their personal development expectations (access to work, to education, to culture, to social relationships, etc.). In fact, it is common for the percentage of non-mobile population to be higher among women who live in neighbourhoods with few public transport services. So, although in these areas women tend to use a private vehicle more frequently, those who cannot use it suffer more from inequality, due to their lack of access to the urban space or the territory. This situation may be accentuated among women who live in neighbourhoods with a high poverty rate or among women with some sort of sensory disability or disorder, as the proportion of immobility among these two groups is higher.

Table 4. Percentage of non-mobile population and restriction to municipality of residence according to sex and public transport accessibility index. 2018

AMB	Poor accessibility by public transport (%)		Good accessibility by public transport (%)	
	Woman	Man	Woman	Man
Non-mobile population	10.0	5.2	8.6	5.5
Restriction to municipality	49.9	42.7	83.6	74.8

Source: Produced using data from EMEF 2018 (ATM).

It must be noted that the city of Barcelona is home to an extensive public transport network, as a response to the high level of mobility of the population. It is a system that can be considered satisfactory in general terms, though the city's complexity and diversity do not always guarantee the same services everywhere. In this context, it must be remembered that 10% of the AMB's population live in neighbourhoods with poor or non-existent accessibility, which highlights the possibility that there are people in this state of disadvantage.

Another of the costs felt by women is linked to inequality in work-life balance. As is well known, the average time of a journey by public transport is longer than one by private transport. This is a constant in the Barcelona Metropolitan Area. Consequently, as they use public transport more, women spend more time travelling each day, because even though the distances they travel are shorter, their journey time is longer. According to ECURB 2017, 87.5% of men in the Barcelona Metropolitan Area take less than 15 minutes to get to work when it is located in their neighbourhood of residence; meanwhile, for women, this figure stands at 76.3%.

4. Some thoughts and final conclusions

As we have seen, less dependence on private motor vehicles, more local journeys, and more frequent use of public transport in the most urbanised, densest areas make women's mobility habits an example to be spread throughout society in this context of climate emergency. However, these patterns are often a response to structural gender inequalities; it is therefore essential to break the link between sociodemographic profile and use of transport. The aim should be for the population to choose the most efficient means of transport at all times, regardless of sociodemographic or economic status, place of residence and type of activity to be carried out. Pursuing this path means that, as social and gender inequalities diminish, women or any other group that suffers from inequality (such as those living in poverty) will not adopt less sustainable and healthy mobility habits. Quite the contrary.

This premise aside, there are some ways through which progress could be made in the public mobility policies:

- Reforming the urban space according to the principles of feminist, sustainable and healthy urban planning.
- Promoting a change in habits in urban contexts, particularly among men: the 'feminisation' of men's mobility patterns is essential in the city especially, where air and noise pollution levels

exceed the recommended limits year after year. A huge supply of public transport services and a largely compact, diverse city model allow this change to be made through private vehicle demand management measures (extension of car and motorcycle parking regulation, urban congestion and pollution tax, etc.), paving the way for a modal shift.

- Offering training and disseminating knowledge: individual perceptions must be changed to favour means of transport that are more resilient in the face of climate change through sustainable mobility education in schools and other educational environments.
- Backing interdisciplinary approaches: more working groups must be created with experts in various disciplines to encourage a more cross-cutting approach. These teams are often made up of engineers or architects, most of whom are men or have been exposed to androcentric perspectives of city and transport system design.
- Improving governance: inter-administration agreements must be made to invest in public transport infrastructures and to implement action deriving from approved mobility plans. Horizontal collaboration within and between administrations must be encouraged in areas of action previously not associated with mobility, such as health, education, work and social rights.

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