Uptake of e-Scooters in Palermo, Italy: Do the Road Users Tend to Rent, Buy or Share?

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Abstract. The uptake of micro-mobility, particularly the use of e-scooters has exponentially grown in Europe. The EU strategies have led to promote the decisions of purchasing, renting and/or sharing e-scooters by making some vital changes to the infrastructure. Several companies have made it possible to rent or share vehicles, while many manufacturers have marketed different models. During the COVID-19 pandemic, e-scooters have become widely popular for short distance travel in Italy as they allow the potential to maintain a social distancing. This paper aims to explore the uptake of e-scooters with an attention to propensity to buy, rent or share those sustainable urban mobility alternatives as well as user perceptions and frequency of use by comparing the periods before and during the third phase of the pandemic. Two sets of surveys were carried out with 200 participants who habitually use e-scooters in Palermo, Italy. 77.5% of the participants had to commute to work during the third phase of the pandemic. Majority of the participants preferred e-scooters as they were economic and environmentally friendly. Road users tended to buy or rent e-scooters during the third phase of the pandemic but they hesitated to share. The results of this study will enhance our understanding of the demand for micro-mobility in the context of interest and will allow for a better planning in consideration to the available options to purchase, share and rent.

Keywords: E-scooters · Renting · Shared mobility · COVID-19 · Sustainable transport

1 Introduction

The COVID-19 pandemic has affected the whole world in many aspects, particularly transport activities. The pandemic has dramatically altered our daily life, including the ways of getting around within a city [1]. A series of measures, such as restricting the

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movement of people and the suspension of economic activities were defined as non-essential, were adopted by the national governments [2]. Several recommendations have been made by the governments and public transport companies. They include fundamental aspects such as keeping social distance in public vehicles, continuous sanitation of vehicles and waiting areas, using sustainable travel modes, particularly walking, cycling and micro-mobility [3, 4]. A survey [5] was carried out in Italy and the results showed that more than 50% of road users do not feel comfortable while travelling by public transport such as metro and bus due to the personal health concerns during the pandemic. As a consequence, public transport has also been severely restricted across Europe [6]. Complying with the social distancing rules issued by governments has reduced the transport capacity by 15% to 35%. This reduction did not cause any major disruption during the lockdown periods, but now with industries reopening, people are looking for fast, safe and efficient alternatives. Therefore, alternative travel modes, especially micro-mobility, started to be preferred by road users.

The term micro-mobility refers to small, lightweight vehicles that people can drive themselves, including electric bicycles and scooters. These are more convenient and environmentally friendly alternatives compared to traditional means of transport, and help to reduce the level of traffic congestion [7]. E-scooters are considered to be at low risk of spreading the virus, as there are fewer places where people put their hands, compared to public transits e.g., buses, trains and trams. In addition, e-scooters can only be used by one person at a time and the rider is in total control of his/her position on the road, which means that it is easier to comply with the social distancing rules [8]. E-scooters are also easy to use for both work and leisure travels [9]. Moreover, they contribute to the EU's zero climate impact strategy for 2050 [10].

Governments and local authorities need to employ strategies for improving infrastructure in order to encourage the trend to prefer e-scooters for short trips. Former studies [11, 12] showed that Brussels established specific zones where the traffic was limited to 20 km/h and the vulnerable road users can travel safely. Creating limited traffic zones should allow a reduction in the use of private vehicles by encouraging sustainable modes of transport. Preventive studies in micro-simulation can help assess the level of service and choose between the best design alternatives for this infrastructural improvement [13, 14]. In addition, the design of shared-use infrastructures should focus on appropriate measures to minimise points of interaction and especially points of conflict between pedestrians and cyclists and also micro-mobility users [15, 16]. However, the infrastructural improvements need a proper urban planning attention and financial resources. Therefore, it is necessary to gain a deeper understanding of the trend of using e-scooters in urban areas. Does the increase of using e-scooters occur due to the first shock of the pandemic conditions, or is it a permanent change of our mobility choices? This study aimed to answer these questions and focus on a statistical evaluation obtained through the administration of an online survey to a sample of e-scooter users in the city of Palermo. This city has been the subject of studies in the last few years regarding both the propensity of people to rent scooters [17] and the importance of the democratic participation of people in the planning of urban interventions for the improvement of the e-scooter service [18].

2 Use of E-Scooters in Palermo, Italy

The new rules for e-scooters were first implemented in 2019 in Italy. It was the year in which the Italian Parliament spent much effort to regularise the use of e-scooters on public road. Following this, the new Italian regulation on the use of e-scooters came into force. From the end of July 2020, the Italian municipalities had largely put these regulations into practice. These actions helped local authorities and road users choose e-scooters as a daily travel mode in urban cities during the COVID-19 pandemic. The severe pandemic condition affected the use of public transport; this means that alternative means of transport capable of guaranteeing greater safety were beginning to be more popular in 2020. Since the lockdown from 9th March 2020 and the partial reopening from 4th May 2020, the use of e-scooters has gained significant importance and become a strategic mean of travel in the city of Palermo. The measure and recommendations, which were promoted by the Ministry of the Environment in agreement with the Ministry of Infrastructure and Transport, aimed to encourage sustainable modes of transport that guaranteed people's right to have mobility in urban areas during this period of COVID-19 emergency. Shared e-scooters started to be used commonly in the urban areas of Palermo, particularly the historic centre since March 2020. A large part of the city falls within the restricted traffic zone, which is referred as ZTL in Italy, and is characterised by a low gradient.

It is planned that, shared e-scooter service will be improved by introducing new regulations and safe and improved infrastructures in Palermo. It is aimed to increase the number of shared e-scooters with more than 1,600 new vehicles, and users will be able to rent via a smartphone app and/or integrated platforms. Rental will be banned for children under the age of 14; therefore, the shared e-scooter is planned to be an adult mobility mode. In order to encourage citizens to use e-scooters, some companies will provide a promotional rate consisting of 0.50 cents and 100 min of free travel by entering a promotional code.

Encouraging the use of e-scooters in urban areas is an important target for local authorities and transport planners. However, it is also a complicated situation. Road users showed a great favour for choosing micro-mobility vehicles, particularly e-scooters, as a daily travel mode during the COVID-19 pandemic. Nevertheless, it is uncertain that increase of using e-scooters might be a temporary behaviour for a period of time. It should be noted that improving infrastructures needs high amount of budget and time. Therefore, critically evaluation of the interest on using e-scooter is essential for decision makers as this links to reform the urban transport beyond the pandemic.

Former studies [3, 19–22] investigated the change of travel behaviour during the COVID-19 pandemic. They have concluded that there has been an increase of using e-scooters in urban city due to the health concerns. However, there has been no study to date focusing on investigating the resistance of this change on road users' preferences. Therefore, the study in this paper investigates the aspects related to the use of private and/or rented or shared scooters in order to explore and investigate how to optimise the services and related infrastructures. In the city of Palermo, it is possible to rent e-scooters from several private shops for a period of time, while the companies that provide the e-scooter sharing service are Helbiz and Lime. Thus, both renting and sharing options

are available in the city of Palermo. These concepts are further scrutinized in the analysis section.

3 Methodology

The aim of this research is to analyse the trend in the use of e-scooters in the city of Palermo. A questionnaire was carried out through the Google survey platform. This methodology eliminates the need for paper and allows for greater response and enhances accuracy [23]. In addition, during the pandemic period, it was not possible to conduct face-to-face surveys with respondents. It is easy to implement and the greatest benefit is obtained from online data collection by increasing productivity and saving time. The data is instantly available and can easily be transferred into specific statistical software or spread sheets if more detailed analysis is required. Furthermore, it is essential that the online survey is responsive for mobile devices to be perfectly visible and usable on any platform. According to market research experts, majority of the users prefer responding to online surveys to written questionnaires or telephone interviews [24]. Therefore, the creation and dissemination of online surveys can be complementary to traditional survey methods via telephone interviews and face-to-face surveys. Finally, the structure of an online questionnaire makes it easy to change the order of questions, or by introducing skip logic based on their answers to the previous questions. In this way, the survey and response path can be tailored to each user. Specifically, the sample was randomly selected from regular micro-mobility users belonging to sector associations in the city of Palermo.

3.1 Study Area

The context related to Italian mobility in 2020 highlights on the one hand a decrease of long-distance trips and on the other hand an increase of short-distance trips especially for leisure. Alongside the increase in car use, there is also an increase in soft mobility, especially in exchange mode: it is increasingly common, for example, to arrive by car at a car park and from there use a bicycle or scooter, even in sharing mode, to cover the last part of the journey. In general, 2 out of 3 Italians rate the spread of scooters for short journeys in the city positively.

The area investigated in this study is the metropolis of Palermo (Sicily) in southern Italy. According to the statistical data recorded for this city, a number of residents as of 2019 of 647,422, of which 23,904 are foreigners. According to the Municipality of Palermo, the connection areas between Favorita, Mondello and Zisa (usually consider like the main tourist attraction areas of Palermo) had a limited parking areas while the pedestrian areas have been characterised by a limited speed, remotely managed (which cannot exceed 25 kms per h) like described in Fig. 1.

Approximately 15.3% of the citizens have a higher educational qualification. Considering the job position, the number of employed men are 115,438 while 74,507 are women. From the point of view of transport dynamics, the city of Palermo is characterised by an intense vehicular traffic along the main roads that circumscribe the limited traffic area of the historic centre. On average, the inhabitants of the city of Palermo walk

Fig. 1. The case study area: Palermo (Source: OpenStreetMap)

0.68 km considering that the average distance that people in Palermo walk every day in one direction, for example going back home or to work, is 3 km [17].

The percentage of people in Palermo who walk more than 1 km every day to reach a specific destination, for example to or from work, is 17%. In the last two years, through the adaptation of the urban sustainable mobility plan, the local authorities have authorised the use of private, rented and shared micro-mobility in some areas of the city, both central and peripheral. These vehicles can only circulate in urban areas and must comply with the speed limits of local and national legislation. Furthermore, it has been established that the devices authorised for experimental circulation can be parked in the areas and parking spaces designated for bicycles and motorbikes, and in any case in places where there is no interference with pedestrians and other vehicles, and in other parking areas that the Administration is identifying with special ordinances. The drivers of the devices must comply with these regulations regarding the parking of vehicles. All services are used in more or less the same way. To rent a scooter, you need to download the app and register for the service. Within the app there is a map showing where the scooters are located and ready to rent.

The vehicles have a QR code which is unlocked with the app and allows you to use the vehicle immediately. The payment of the corresponding tariff is also made via the app. Figure 2 shows some of the points where it is possible to find and share electric scooters in Palermo.

The data recorded by the Moovit digital platform [25] on micromobility in 2019 and 2020 in the city of Palermo show a slight increase in the propensity to use scooters and the like, as described in Fig. 3, where the frequency of use is shown.

Other data provided by the above mentioned platform show that the main motivation for moving in 2020 in micro-mobility was related to the eco-friendly vision of these means of transport, while in the previous year the majority of the interviewed users preferred electric scooters because they are faster than walking. The main reasons for non-use in 2019 and 2020 are related to the absence of bicycle lanes and poor road maintenance.

The purchase of scooters by private individuals has risen sharply since December 2019 due to governmental incentives. In Italy, more than 600,000 purchases of bicycles and scooters have been registered (614,000 to be precise) due to a specific bonus. The rental of electric scooters in Palermo started in 2020 through some shops or specialised

Fig. 2. Dockless e-scooters and the areas where they are predominantly located (Source: OpenStreetMap)

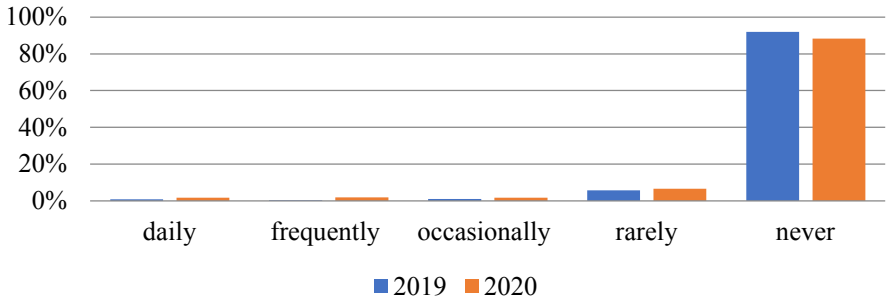

Fig. 3. Comparing the frequencies of using e-scooters between years 2019 and 2020

centres, but also some hotels or B&Bs have made available some electric modes to cover short distances. The service of sharing electric scooters in Palermo is to be paid for by credit card or cash at authorised points of sale, is totally sustainable and constitutes an alternative for private travel in the city in accordance with European measures that will make an important contribution to the ecological and sustainable mobility of the city of Palermo. The sharing service has started with four different operators that could potentially become nine.

3.2 Data Collection

The sample has been characterised by 200 users as better described below instead the survey has foreseen the creation of 3 sections:

1. Socio-demographic data (6 questions).
2. The judgment on the use of e-scooter (8 questions of Likert Scale 1 to 5)
3. The movement habits before and after the COVID-19 with the e-scooter with a judgement on a Likert scale for 7 different questions.

The survey was planned to collect data during the period January-March 2021, close to the discovery of the COVID vaccinations. Table 1 shows the variables investigated and the possible responses.

Table 1. Survey and relative sections

<table>
<tr><td colspan="4">Section 1 - Sociodemographic variables</td></tr>
<tr><td>Gender</td><td>Age groups</td><td>Ownership (yes-no)</td><td>Employment</td></tr>
<tr><td>Male
Female</td><td>18–24
25–39
40–54
55–65
≥65</td><td>Car
Bike
e-scooter</td><td>Worker
Student
Other</td></tr>
<tr><td colspan="4">Section 2 – e-scooter using habits</td></tr>
<tr><td colspan="3">How economically advantageous do you think is moving with e-scooter?</td><td rowspan="10">Using a Likert scale from 1 to 5 where:
1 = completely disagree
2 = disagree
3 = neutral
4 = agree
5 = completely agree</td></tr>
<tr><td colspan="3">How eco-friendly do you consider moving with e-scooter?</td></tr>
<tr><td colspan="3">How inclined are you to rent an e-scooter?</td></tr>
<tr><td colspan="3">How inclined are you to buy an e-scooter?</td></tr>
<tr><td colspan="3">How inclined are you to share an e-scooter?</td></tr>
<tr><td colspan="3">How useful do you think GPS is when using e-scooter?</td></tr>
<tr><td colspan="3">How useful do you think a platform/social community or where is possible to add experiences with e-scooter?</td></tr>
<tr><td colspan="3">Do you think your propensity to use e-scooter has increased post-COVID?</td></tr>
<tr><td colspan="3">How economically advantageous do you find moving with e-scooter?</td></tr>
<tr><td colspan="4">Section 3 - Travel frequency before and after COVID-19</td></tr>
<tr><td colspan="2">How often did you use your e-scooter?</td><td colspan="2" rowspan="4">Likert frequency scale from 1 to 5 1 = I tried it once,
2 = Less than once a month;
3 = Several times per month;
4 = Several times per week;
5 = Daily</td></tr>
<tr><td>before COVID-19 H-W</td><td>after COVID-19 H-W</td></tr>
<tr><td>before COVID-19 H-L</td><td>after COVID-19 H-L</td></tr>
<tr><td>before COVID-19 H-BN</td><td>after COVID-19 H-BN</td></tr>
<tr><td colspan="3">Did you use teleworking after COVID?</td><td>1 = yes
2 = no
3 = partially</td></tr>
</table>

4 Results

The results obtained from the first section showed that the sample was well balanced in terms of the gender of the users with 47% female and 53% male. The age-related distributions showed a higher percentage of users aged between 40–54 years and about 72% of the sample was characterised by working professionals (users) as shown in Fig. 4.

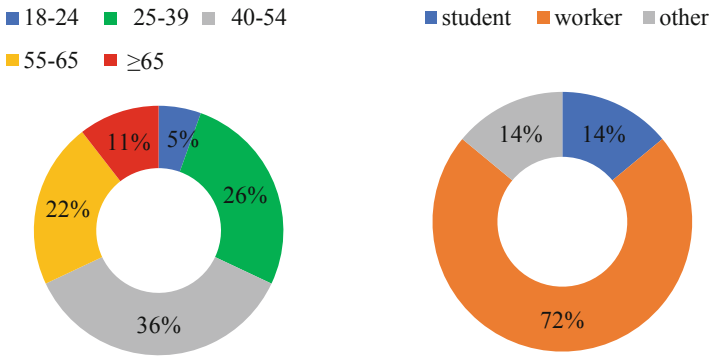

Fig. 4. Demographic distribution by age and status

The first section also investigated car ownership (left), which characterised the largest proportion of the sample, bicycle ownership (centre) and micro-mobility (right), obtaining the following distributions respectively defined by Fig. 5.

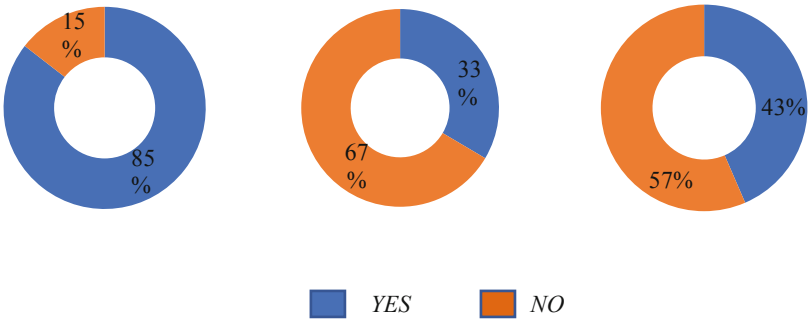

Fig. 5. Ownerships of car, bicycle and micro-mobility

Section 2 investigated through a judgment expressed on a Likert scale from 1 (completely disagree) to 5 (completely agree) with the vision of e-scooters as economically advantageous and eco-friendly means, obtaining the comparative distribution of Fig. 6, which shows a positive response on a scale value of 4 for both variables, with a slightly higher value for the economic aspect compared to the environmental one.

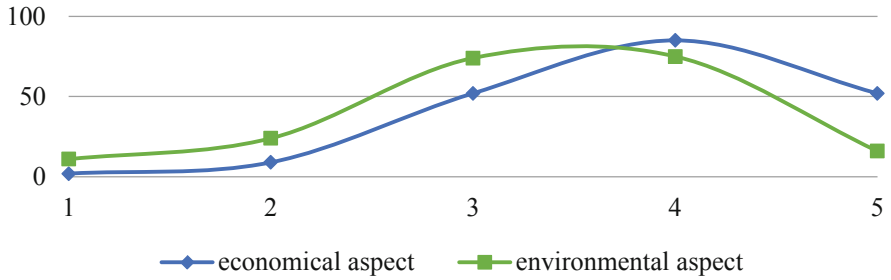

Fig. 6. The values associated with economic and environmental aspects

Using the same rating scale, the usefulness of the use of GPS systems for vehicle geolocation and the use of digital platforms for booking or release was investigated considering the concept of Mobility as a Service - Maas. The data showed the trends shown in Fig. 7.

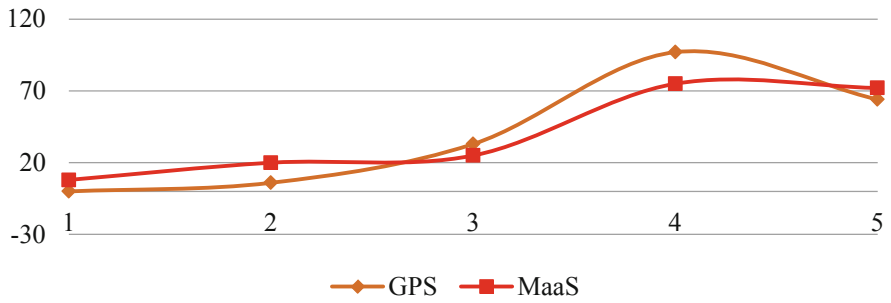

Fig. 7. Usefulness of GPS systems for vehicle geolocation and digital platforms for booking or release

The distribution of the propensity to buy, rent and share electric scooters on a Likert scale from 1 (strongly disagree) to 5 (strongly agree) correlates with the trend in Fig. 8. There is a preponderance of neutral or positive responses with a greater trend towards rating 3 for sharing and rating 4 and 5 for renting. Probably part of the results is due to the testing of the shared service from March 2021.

The third section investigated the frequency of use of the electric scooter before (before March 2020) and after the pandemic (after March 2020 until today) obtaining the following distributions for various reasons of travel and with reference to.

– Home-work trip (H-W)
– Home-work displacement (H-L)
– Home shopping (H-BN)

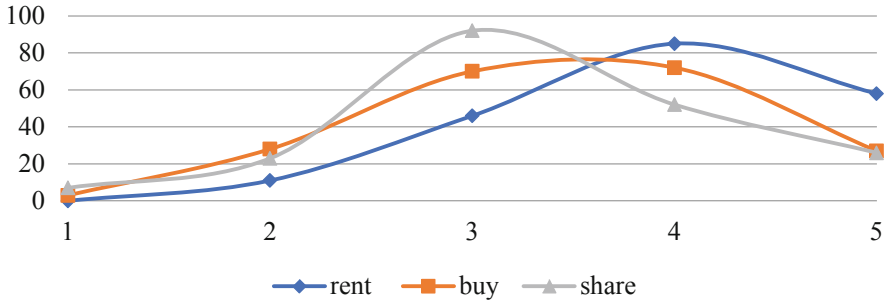

Fig. 8. Propensity distribution to buy, rent and share electric scooters

Specifically, with regard to home-work travel (H-W), the trend shown in Fig. 9 was obtained, where more than 100 users had a favourable opinion of the electric scooter before COVID, but this value fell during COVID, with a neutral opinion. This is closely linked on the one hand to the closure of certain work activities and on the other hand to the introduction of teleworking.

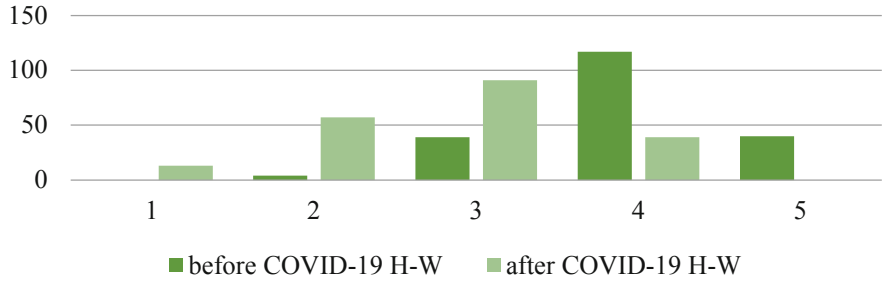

Fig. 9. Home-Work travel (H-W) scenarios before and after COVID-19

These data reflect the general trend of the city of Palermo recorded in March 2021 compared to March 2020 in the pre-pandemic phase with a value of −24% of trips for work [26]. These trends also reflect the regional trend that refers on average to the 9 capital cities. With regard to travel for home-work reasons, Fig. 10 shows that the neutral response prevails both before and after COVID: this is due to the fact that the scooter is useful for short journeys and that there are no recharging stations in the city to power it. In addition, during the pandemic period, the restrictions and recommendations provided by the government have reduced travel in general.

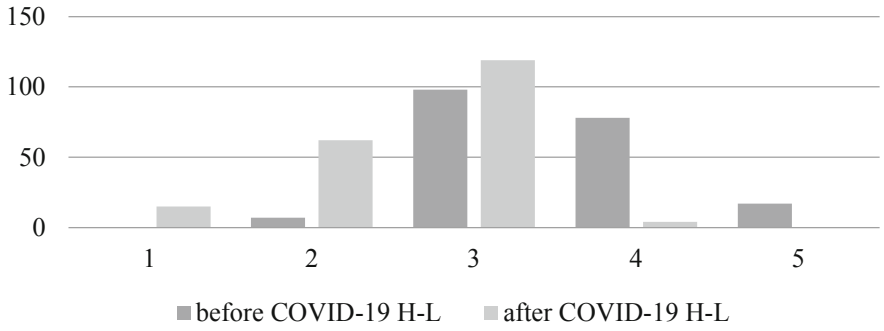

Fig. 10. H-L scenarios before and after COVID-19

With regard to travel for the purchase of basic necessities such as medicines or food, the results obtained are described in Fig. 11, which shows a largely neutral response for the pre-COVID period and a favourable response (4) in the post-pandemic phase. This trend is due to the fact that the purchase of basic necessities in the pre-pandemic phase took place mainly over long distances because of the positioning of the large food distribution chains, whereas in the pandemic phase people preferred to buy goods close to home or via e-commerce. The biggest purchases in the pandemic phase were medicines, sanitation products and masks.

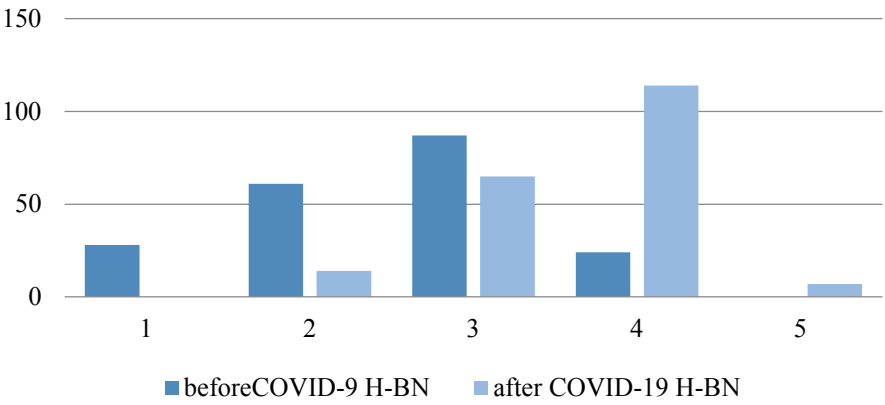

Fig. 11. H-BN scenarios before and after COVID-19

Finally, the respondents were asked to express whether their work activities are proceeding by teleworking, with the result that about 63% carry out their activities partially from home and about 22% completely from home. A small percentage of them (15%) continue to go to work. This answer also partly justifies the trends in Fig. 9. The trends shown in the previous figures also reflect the general travel trends in the city recorded in March 2021 [27] with 28% of trips for retail and leisure and +5% for trips for purchasing essential goods (groceries and pharmacies).

5 Discussion and Conclusions

Scooter sharing has been getting more attention from transport users in Palermo since March 2020. A few days after the service was activated, many people have tested the service offered by various companies in compliance with the measures on distancing and crowding of areas to reduce COVID-19 infections. In the meantime, another 800 e-scooters will be on their way, with the authorisation of two new companies. The local administration's urban mobility planning and design activities fit in well with the expansion of the city's network of cycle paths and the creation of new parking areas for mobility, taking into account the favourable climatic conditions that the city enjoys several months a year.

Strategies are aiming at the expansion of pedestrian areas, traffic zones and cycle paths to improve citizens' living conditions and policies on sustainability and decarbonisation. The present work shows a first step of investigation on the propensity to use e-scooters, considering purchase, rental and sharing. The results suggested a positive notion for renting, which is higher than for sharing. They can be justified by the fact that rental companies provide more scooters than shared scooter companies and are able to maintain them more easily.

Furthermore, the data refer to the first months in which the sharing services were activated, there is a phase of first approach by Palermo inhabitants to sharing e- scooters. The results also show that the use of the scooter was more successful for home-work transfers, especially during the pandemic period in the case of short distances (less than 2 km). Moreover, a positive trend was also observed to use e-scooters for trips associated with basic necessities. Therefore, an increasing tendency emerges to use these means during the post-pandemic period as well that respects social distancing as well as establishes its perception/branding as eco-friendly which is faster than walking. The use of technology, geo-localisation and digital platforms for booking vehicles was found to be strongly correlated with the use of these modes of transport. Although the research focused on a small sample size, it shows that despite COVID-19 has reduced travel volume, users are changing their travel habits with a preference for short (distances) trips using slow mobility and micro-mobility, thus limiting the use of private vehicles. Future research will focus on the statistical-descriptive evaluation of a larger sample as well as investigating the users' propensity to use the services provided by different sharing companies operating in the city of Palermo.

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Conflicts of Interest. The authors declare no conflict of interest.

References

1. Shrestha, N., et al.: The impact of COVID-19 on globalization. One Health **11**, 100180 (2020)
2. Vaughan, A.: Italy in lockdown. New Sci. **245**(3273), 7 (2020)
3. Campisi, T., Basbas, S., Skoufas, A., Akgün, N., Ticali, D., Tesoriere, G.: The impact of COVID-19 pandemic on the resilience of sustainable mobility in sicily. Sustainability **12**(21), 8829 (2020)
4. Nahiduzzaman, K., Lai, S.-K.: What does the global pandemic COVID-19 teach us? Some reflections. J. Urban Manage. **9**(3), 261 (2020)
5. STATISTA (2020). https://www.statista.com/statistics/1123287/post-covid-intercity-public-transport-use-frequency-intentions-in-italy/
6. Newman, A.O.: COVID, cities and climate: historical precedents and potential transitions for the new economy. Urban Sci. **4**(3), 32 (2020)
7. Campisi, T., Nahiduzzaman, K.M., Ticali, D., Tesoriere, G.: Bivariate analysis of the influencing factors of the upcoming personal mobility vehicles (PMVs) in palermo. In: Gervasi, O., et al. (eds.) ICCSA 2020. LNCS, vol. 12250, pp. 868–881. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-58802-1_62
8. Dickson, I.: Social distancing: a COVID conundrum for commuters or a dawning for e-scooters? (2020). https://360.here.com/covid-19-electric-scooters
9. Gössling, S.: Integrating e-scooters in urban transportation: problems, policies, and the prospect of system change. Transp. Res. Part D Transp. Environ. **79**, 102230 (2020)
10. Møller, T.H., Simlett, J.: Micromobility: moving cities into a sustainable future. EYGM Limited (2020). https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/automotive-and-transportation/automotive-transportation-pdfs/ey-micromobility-moving-cities-into-a-sustainable-future.pdf
11. Hubert, M., Corijn, E., Neuwels, J., Hardy, M., Vermeulen, S., Vaesen, J.: From pedestrian area to urban project: assets and challenges for the centre of Brussels. BSI synopsis. In: Brussels Studies. La revue scientifique électronique pour les recherches sur Bruxelles/Het elektronisch wetenschappelijk tijdschrift voor onderzoek over Brussel/The e-journal for academic research on Brussels (2017)
12. Raptopoulou, A., Basbas, S., Stamatiadis, N., Nikiforiadis, A.: A first look at e-scooter users. In: Nathanail, E.G., Adamos, G., Karakikes, I. (eds.) Advances in Mobility-as-a-Service Systems: Proceedings of 5th Conference on Sustainable Urban Mobility, Virtual CSUM2020, June 17-19, 2020, Greece, pp. 882–891. Springer International Publishing, Cham (2021). https://doi.org/10.1007/978-3-030-61075-3_85
13. Campisi, T., Canale, A., Tesoriere, G., Lovric, I., Čutura, B.: The importance of assessing the level of service in confined infrastructures: some considerations of the old ottoman pedestrian bridge of mostar. Appl. Sci. **9**(8), 1630 (2019)
14. Basbas, S., Campisi, T., Canale, A., Nikiforiadis, A., Gruden, C.: Pedestrian level of service assessment in an area close to an under-construction metro line in Thessaloniki, Greece. Transp. Res. Procedia **45**, 95–102 (2020)

15. Nikiforiadis, A., et al.: Quantifying the negative impact of interactions between users of pedestrians-cyclists shared use space. In: Gervasi, O., et al. (eds.) ICCSA 2020. LNCS, vol. 12250, pp. 809–818. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-58802-1_58
16. Nikiforiadis, A., Basbas, S., Garyfalou, M.I.: A methodology for the assessment of pedestrians-cyclists shared space level of service. J. Cleaner Prod. **254**, 120172 (2020)
17. Campisi, T., Akgün, N., Tesoriere, G.: An ordered logit model for predicting the willingness of renting micro mobility in urban shared streets: a case study in Palermo, Italy. In: Gervasi, O., et al. (eds.) ICCSA 2020. LNCS, vol. 12250, pp. 796–808. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-58802-1_57
18. Campisi, T., Akgün, N., Ticali, D., Tesoriere, G.: Exploring public opinion on personal mobility vehicle use: a case study in Palermo, Italy. Sustainability **12**(13), 5460 (2020)
19. Tarasi, D., Daras, T., Tournaki, S., Tsoutsos, T.: Transportation in the Mediterranean during the COVID-19 pandemic era. Global Transit. **3**, 55–71 (2021). https://doi.org/10.1016/j.glt.2020.12.003. ISSN 2589–7918
20. Bereitschaft, B., Scheller, D.: How might the COVID-19 pandemic affect 21st century urban design, planning, and development? Urban Sci. **4**, 56 (2020). https://doi.org/10.3390/urbansci4040056
21. Almannaa, M.H., Alsahhaf, F.A., Ashqar, H.I., Elhenawy, M., Masoud, M., Rakotonirainy, A.: Perception analysis of e-scooter riders and non-riders in Riyadh, Saudi Arabia: survey outputs. Sustainability **13**, 863 (2021). https://doi.org/10.3390/su13020863
22. Li, A., Zhao, P., He, H., Axhausen, K.W.: Understanding the variations of micro-mobility behavior before and during COVID-19 pandemic period. Arb. Verk. Raumplan. **2020**, 1547 (2020)
23. Richardson, A.J., Ampt, E.S., Meyburg, A.H.: Survey Methods for Transport Planning, pp. 75–145. Eucalyptus Press, Melbourne (1995)
24. Wright, K.B.: Researching Internet-based populations: advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. J. Comput.-Mediat. Commun. **10**(3), JCMC1034 (2005)
25. Moovit (2020). www.moovitapp.com
26. Moslem, S., Campisi, T., Szmelter-Jarosz, A., Duleba, S., Nahiduzzaman, K.M., Tesoriere, G.: Best–worst method for modelling mobility choice after COVID-19: evidence from Italy. Sustainability **12**(17), 6824 (2020)
27. Google. Google mobility reports, Italy (2020). https://www.google.com/covid19/mobility/index.html?hl=it