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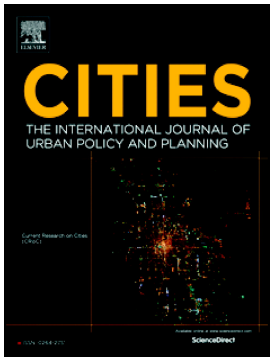


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Maria Kamargianni, Christina Georgouli, Luciano Pana Tronca, Manos Chaniotakis

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**Title**

Changing transport planning objectives during the Covid-19 lockdowns: actions taken and lessons learned for enhancing sustainable urban mobility planning

**Authors**

Maria Kamargianni [a,1], Christina Georgouli [a], Luciano Pana Tronca [a], Manos Chaniotakis [a]

[a] MaaSLab, Energy Institute, University College London, 14 Upper Woburn Place, WC1H 0NN, London, UK

[1]Corresponding author. Postal address: 14 Upper Woburn Place, WC1H 0NN, London, UK. E-mail address: m.kamargianni@ucl.ac.uk

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**Declarations of interest**

None

# Changing transport planning objectives during the Covid-19 lockdowns: actions taken and lessons learned for enhancing sustainable urban mobility planning

**ABSTRACT**

Whilst there is research on how Covid-19 impacted travel demand and transport business, little attention has been paid on how Covid-19 has affected authorities' transport planning priorities and the actions taken to protect the public while travelling. This paper attempts to shed light on: a) how the transport planning priorities changed during the Covid-19 lockdowns in 2020/2021, and b) how the planning phases of the Sustainable Urban Mobility Plan (SUMP) framework can be strengthened to support a more resilient emergency planning environment. To address these questions, an online questionnaire was designed followed up by personal interviews from selected European cities. Data collection took place in November and December 2020, when most European countries were in lockdowns. Thirteen public authorities participated in the online questionnaire, while nine out of them were further interviewed. A mixed methods approach is used to analyse the quantitative and qualitative data and bring the results together to assess how SUMP priorities have changed. The results showed that the priority planning objectives were different in the period during the 2020/2021 lockdowns compared to the period before that. Public transport system planning was a priority in both periods, while planning for shared mobility and Mobility as a Service was further prioritised in the 2020/21 lockdowns. The main reasons for prioritising specific planning objectives were to secure public health, minimise environmental impact, support economic recovery and address social equity. The changes in the priority of planning objectives were also diverse between smaller and larger urban areas. Most of the actions adopted to accommodate the prioritised planning objectives were already defined before Covid-19, indicating that the lockdowns have acted as an accelerator of specific existing planning objectives.

**Keywords**: Covid-19, transport planning, authorities, SUMP, emergency planning

## INTRODUCTION

The Covid-19 pandemic has brought previously unforeseen challenges and changes in travel behaviour patterns. The transport system now has to operate in a way which ensures -even more- public health is secured, while at the same time minimising consequent impacts on the economy caused by the urban planning measures (reduced mobility to limit spread of the virus, increased road space for active modes). Social distance measures have imposed the necessity to perform trips in isolation or with reduced capacity on the transport modes. Transport authorities and operators have to adapt their mobility systems and services to respond to the pandemic crisis and at the same time to offer safe services.

Since the breakout of the Covid-19 pandemic, several papers have been published exploring primarily the impact of Covid-19 on the transport system performance and travel

behaviour. Querying Scopus[1] on 14/12/2021, an astonishing 4794 results were retrieved (as opposed to 202 results retrieved on 19/04/2021) in areas such as social sciences, environmental sciences, energy, and engineering. Several of these papers focus on exploring the impact of Covid-19 on travel behaviour and the transport system (Andreoni, 2021; Awad-Nunez et al., 2021; Bian, et al., 2021; Budd & Ison, 2020; Nurse & Dunning, 2020; Coppola & De Fabiis, 2021; Hensher et al., 2021; Kim et al., 2021; Gutiérrez et al., 2020; Vickerman, 2021; Sharifi & Khavarian-Garmsir, 2020; Zhang, 2020; Zhang et al., 2021; Marsden et al., 2021; Nundy et al., 2021, Rothengatter et al., 2021, Marra et al., 2021). For example, Gkiotsalitis & Cats (2020) investigated the impact of the pandemic on the public transport systems highlighting that the post-shutdown phase poses a multi-dimensional challenge. They proposed that to increase resilience in the sector, there is a need to address the demand side considerations, the perception of users on health risk derived from transport options, and the financing of public transport.

Most of the transport-related published work focuses on public transport and there are less papers on new mobility services and active travel. Hensher (2020) elaborated on the impact of Covid-19 on the concept of Mobility as a Service (MaaS) suggesting a decrease of shared mobility and increase of working from home. For active travel, Combs & Pardo (2021) analysed a database for mobility related actions during Covid-19 proposing that an in-depth case study effort should be made to identify those actions that were going to be deployed even without Covid-19, those that were reactionary and those that were responsive. They also make the case for linking the actions with broader societal goals such as equity and safety.

Additionally, several organisations have published reports that compile the actions and measures that city and regional authorities implemented in transport due to Covid-19. For example,a UITP (2020) report looks into changes in mobility patterns, the role of MaaS and a Unified Mobility Management Model to increase resilience in the transport systems. The European Institute of Innovation and Technology published a report (EIT, 2021) looking into the effects of the pandemic on urban mobility and main actions, highlighting the shift towards individual mobility, increase in parking demand and urban freight. More interestingly, the POLIS Network published a Sustainable Urban Mobility Plan (SUMP)[2] topic guide on resilience and transport planning (POLIS, 2021), including case studies, short- and long-term measures recommendations. However, it does not cover the transport planning changes and the barriers the authorities faced during the lockdowns to implement some of the COVID-19 relevant measures that were included in their strategies or SUMP.

Whilst there is considerable research on how Covid-19 impacted travel demand, and the transport supply side, little attention has been paid on how Covid-19 affected the transport planning priorities of authorities during the 2020/2021 Covid-19 lockdowns. In addition, limited are the insights about the barriers the authorities faced in terms of implementing measures

[1] Scopus Query used: "Covid-19 impact transport"
[2] https://www.eltis.org/mobility-plans/sump-process

that were already included in their strategies or SUMPs during the emergency period of 2020/2021 lockdowns, and how these barriers in the SUMP framework could be overcome in the future. Against this background, the objectives of this paper are to explore:

1. How did transport planning priorities change during the 2020/2021 Covid-19 lockdowns[3]?
2. What actions were taken to implement the prioritised objectives and what were the reasons behind them?
3. What barriers did the authorities face and how can the planning phases of the SUMP framework be strengthened to support emergency planning and a more resilient planning environment?

This research contributes to the exploration of how specific European cities reacted during the 2020/2021 lockdowns. The identified actions could inspire other cities for tackling similar situations, and can also act as a summary for lessons learned from this period. The recommendations contribute to the enhancement of the SUMP framework that is widely applied in Europe, for public authorities to be able to act in a more organised way during emergency events.

The remaining of the paper is structured as follows. Section 2 explains the methods, including the survey design, data collection and sample characteristics. Section 3 presents the results, elaborates on transport planning objectives before and during the 2020/2021 Covid-19 lockdowns, the prioritised objectives, the actions that were taken to achieve the objectives, as well as gaps in emergency planning. Section 4 identifies the barriers authorities faced in terms of applying specific parts of their strategies/SUMP during the pandemic and provides recommendations on how to enhance the SUMP framework to be able to support emergency planning. Section 5 concludes the paper with the main lessons learned and afterthoughts of the research.

## METHODS

This section presents the tool designed to collect the data for this research, the data collection process, and the characteristics of the authorities participated in the survey.

### Survey Design

Given the objectives of the research, a questionnaire was designed to capture the changes in planning objectives during the Covid-19 lockdowns, and explore how the SUMP planning phases can be strengthened to support a more resilient planning environment (this research is part of the European Commission's Horizon 2020 funded project HARMONY[4]. To design the questionnaire, we had several rounds of bilateral discussions with the authorities that are partners of the HARMONY project. They provided feedback in terms of the planning objectives

[3] We specifically explore the whole 2020 year and the winter/spring 2021, when most of the European countries were in lockdowns and vaccines were not available. For saving space, we refer to this period in the manuscript as 2020/2021 Covid-19 lockdowns.

[4] https://harmony-h2020.eu (grant agreement number: 815269)

and the objectives listed in the SUMP frameworks supporting us in the development of the questionnaire. Before the official launch of the survey, they also tested it, and provided feedback to arrive to the final version of the questionnaire.

The questionnaire includes five sections:

- Section 1 contains questions regarding the profile of the participant organisation, as well as the profile of the organisation's representative.
- Section 2 includes questions on the planning environment and decision-making process within the organisation both before and during the 2020 lockdowns.
- Section 3 includes questions about the actions followed to apply the planning objectives that were prioritised during the Covid-19 lockdowns.
- Section 4 focuses on the barriers and opportunities the authorities were faced with in terms of implementing some related measures that were included in their strategies / SUMPs.
- Finally, section 5 includes questions on tools that the authorities use for urban and transport planning, as well as provision of training support.

Given the scope of this paper, only the questions included in sections 1 to 4 were used for the analysis. The questionnaire was used both for online data collection and for interviews.

Initially, the online version of the questionnaire was distributed to European-based stakeholders via various channels such as personalised emails to public authorities (including the five authorities that are partners of the HARMONY project (Athens, Trikala, Turin, Katowice, Rotterdam, Oxford), and posts on social media (LinkedIn and Twitter) inviting representatives of public authorities. The EU's CIVITAS[5] Initiative also disseminated the survey on social media (Twitter).

Then, the same questionnaire was used, to those who agreed to be contacted for an interview when they filled-in the online questionnaire. But during the interviews emphasis was put only on sections 2 to 4, to look deeper into the authorities' changes in planning priorities, the driving factors behind those changes, and the approaches the authorities followed to deal with the Covid-19 crisis. The interviews were performed by the same two researchers via online video calls to ensure consistency and smooth coordination of the sessions. The interviews were in English. Each interview lasted approximately one hour, and it was also recorded following the written consent of the interviewees. The interviews were semi-structured in the sense that predetermined questions were asked, but given the flow of the conversation during the interview, additional follow up questions were performed.

**Data collection, sample characteristics** and analysis method

The data collection process took place in November and December 2020, when almost all European countries were in a lockdown. As mentioned above, except from official mail invitations to European-based public authorities, we also made the link of the questionnaire available on social media aiming to attract the interest of authorities that were not included in

[5] https://civitas.eu

the authors' contact list. By doing this, the authors were aware that the questionnaire would be answered by several participants that were out of their target sample. As such, the online questionnaire was answered by 108 individuals. Out of them the 19 were representatives of public authorities. The remaining 89 responses consisted mainly of research institutes or academia, consultancies, and associations or lobbies. These types of organisations were excluded from the analysis since the focus of this study is to capture changes on authorities' planning priorities and decision making. After cleaning the dataset, we ended up with 13 valid responses from representatives of European-based public authorities. Authorities from the US, Africa and Australia also participated in the survey. However, due to the low participation and the different planning approaches in these areas, we did not take them into account for this specific paper. 9 out of the 13 representatives of public authorities that participated in the online questionnaire, agreed to further be interviewed. The average completion time of the on-line questionnaire was 17.6 minutes; the interviews lasted about an hour (minutes duration of interview: 55 minutes; maximum: 74 minutes).

Although the sample size may be considered small, for such a survey that focuses only on European-based public authorities, it is considered satisfactory and it is also in line with previous efforts to explore practices of public authorities even before the Covid-19 outbreak (Jennings, 2020; Johansson et al., 2019). It should be also noted that when the survey took place almost all European countries were in a lockdown, no vaccines were available and several employees in authorities were on furlough; while the priority of those who were working was to secure public health having limited time to participate in surveys. As such, it was difficult to reach such organisations and have a larger sample. In addition, the fact that the survey was available only in English may be another reason for this sample size, but the most important is the Covid-19 situation. The final sample of 13 responses has variability as it includes respondents from seven different European countries, as well as small, medium and large urban areas.

The characteristics of the public authorities participated in the survey are shown in the upper part of Table 1, while the characteristics of the representatives are presented in the lower part. The public authorities participated in the survey are located in areas across seven different European countries, with various population sizes ranging from small urban areas to large metropolitan areas. Most of the authorities employee more than 250 employees. Regarding the authority representatives' characteristics, they hold key positions in the organisation, and they mainly work for the innovation departments. Although age of respondents is quite diverse, there is an imbalance in gender reflecting the male-dominated employment in the transport sector and transport policy (European Commission, 2010). Table 2 considers the different types of Covid-19 restrictions that applied to the city's/region's country. The table also indicates whether the city or region has a SUMP, as well as the available transport modes.

| Characteristic | Category | Online questionnaire | Interviews |
|---|---|---|---|
| | **Characteristics of the public authority** | | |
| **Location** | Graz, Austria (AU) | 1 | 0 |
| | Flanders Region, Belgium (BE) | 1 | 1 |

| | | | |
|---|---|---|---|
| | Aachen and the border region, Germany (DE) | 1 | 1 |
| | Athens, Greece (GR) | 1 | 1 |
| | Trikala, (GR) | 1 | 1 |
| | Como, Italy (IT) | 1 | 0 |
| | Milan, (IT) | 1 | 0 |
| | Turin, (IT) | 1 | 1 |
| | Katowice Metropolitan Area, Poland (POL) | 1 | 1 |
| | London, United Kingdom (UK) | 1 | 0 |
| | Middlesbrough, (UK) | 1 | 1 |
| | Oxford, (UK) | 1 | 1 |
| | West Midlands, (UK) | 1 | 1 |
| **Size of organisation** | Micro (<10 employees) | 0 | 0 |
| | Small (10-49 employees) | 2 | 2 |
| | Medium (50-249 employees) | 2 | 2 |
| | Large (>250 employees) | 9 | 5 |
| **Size of area (population)** | < 50,000 inhabitants (small area) | 0 | 0 |
| | 50,000-200,000 inhabitants (small area) | 4 | 3 |
| | 200,000-500,000 inhabitants (medium area) | 2 | 0 |
| | 500,000-1,500,000 inhabitants (large area) | 3 | 3 |
| | > 1,500,000 inhabitants (large area) | 4 | 3 |
| **Characteristics of the public authority' representative participated in the survey** | | | |
| **Age** | <25 | 0 | 0 |
| | 25-34 | 2 | 2 |
| | 35-44 | 4 | 4 |
| | 45-54 | 6 | 2 |
| | 55-64 | 1 | 1 |
| | >64 | 0 | 0 |
| **Gender** | Male | 11 | 7 |
| | Female | 2 | 2 |
| **Department** | Transport planning | 6 | 4 |
| | Transport Innovation | 2 | 2 |
| | Other | 5 | 3 |

*Table 1: Sample characteristics*

| **Public transport authority** (size of the area – see Table 1) | **SUMP** | **Available transport modes** | **Covid-19 restrictions – November-December 2020** | | | | |
|---|---|---|---|---|---|---|---|
| | | | **Ban on events** | **Non-essential shops closed** | **Private gatherings** | **Stay home order** | **Closure of public transport** |
| **Graz, AU** (medium) | Yes | T, B, Tr, Cs | Yes | Yes | Yes | Yes | No data |
| **Flanders region, BE** (large) | Yes | T, B, Tr, Cs, Bs, Es | Yes | Yes | Yes | Yes | No data |
| **Aachen, DE** (large) | Yes | T, B, Cs, Bs, Es | Yes | No | Yes | Yes | No data |
| **Athens, GR** (large) | Yes | T, B, Tr | Yes | Yes | Yes | Yes | No |
| **Trikala, GR** (small) | No | B, Bs | | | | | |
| **Como, IT** (small) | No | B, Cs, Bs | Yes | No | Yes | Yes | Yes |
| **Milan, IT** (large) | No | All | | | | | |
| **Turin, IT** (large) | Yes | All | | | | | |
| **Katowice Metropolitan Area, POL** (large) | No, under development | All | Yes | Yes | Yes | Yes | Yes |
| **London, UK** (large) | Yes | All | Yes | Yes | Yes | Yes | No |
| **Middlesbrough, UK** (small) | Yes | T, B, Cs, Es* | | | | | |
| **Oxford, UK** (small) | Yes | T, B, Cs, Bs, Es* | | | | | |
| **West Midlands , UK** (large) | Yes | T, B, Tr, Cs, Bs, Es* | | | | | |

T: train; B: bus; Tr: tram; Cs: car sharing; Bs: bike sharing; ES: electric scooter sharing
*e-scooter sharing service trial during Covid-19

*Table 2: Existence of SUMP, available transport modes, and Covid-19 restrictions in the areas participated in the survey (partial or full restrictions considered as "Yes")*[6]

Finally, the quantitative data from the online survey, is statistically analysed using SPSS. The qualitative data from the online questionnaire and the interviews is thematically analysed based on topics using NVivo (Nikitas, et al., 2018; Nikitas et al., 2019). The interviews were transcribed into the NVivo qualitative data analysis software. Aided by the software, the transcripts were thoroughly scrutinised and relevant concepts were appropriately coded. The codes were organised hierarchically, which resulted in a topology of related concepts. By re-reading the transcripts and refining the codes, a number of themes emerged, which were then further refined to arrive at a final set of relevant themes.

## RESULTS AND ANALYSIS

[6] Source: European Centre for Disease Prevention and Control: "Data on country response measures to COVID-19", retrieved from: https://www.ecdc.europa.eu/en/publications-data/download-data-response-measures-covid-19

This section presents the findings from the data analysis. It starts by presenting the authorities' priority planning objectives before the Covid-19 outbreak and during the 2020/2021 Covid-19 lockdowns. It elaborates on the actions and planning approaches the authorities took to implement the prioritised objectives during the Covid-19 lockdowns, as well as the reasons/driving forces behind these actions. Then, the gaps that authorities have in emergency planning are discussed.

**Planning objectives before and during the 2020/2021 Covid-19 lockdowns**

The results of the survey indicate that there has been changes in the planning priorities that authorities targeted before and during the outbreak of the pandemic. Respondents of the survey were given a list of 13 planning objectives, and they were asked to rank the 5 most important objectives for their area for the period before and for the period during the 2020/2021 Covid-19 lockdowns (section 2 of the questionnaire). Respondents had the option to specify additional planning objectives if not already in the given list, and they could also skip answering for the period during the Covid-19 lockdowns, meaning that the planning objectives remained the same. Figure 1 illustrates the frequencies of the selected objectives for the two time-periods.

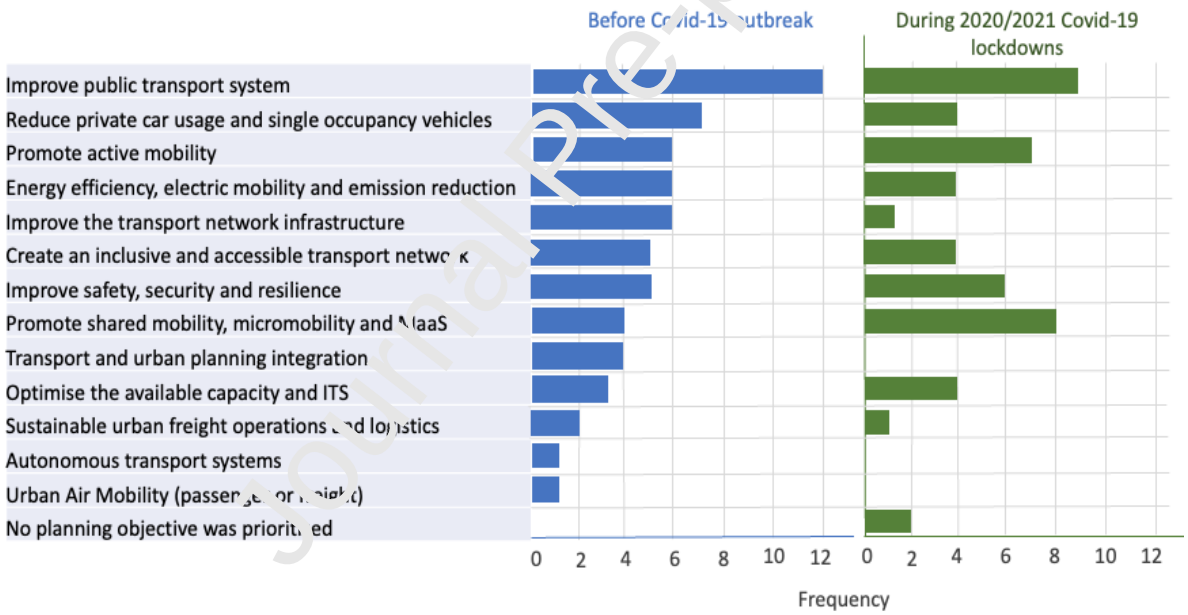


*Figure 1: Selected planning objectives before) and during Covid-19 outbreak [ITS= Intelligent Transport Systems]*

In the "Before Covid-19" period, the objective that was selected the most is to "Improve public transport system"; selected by all but one authority. "Reduce private car usage and single occupancy vehicles" objective was the second most popular. In the third place there are three objectives -all selected by six authorities-, which are to "Improve the transport network infrastructure", "Promote active mobility" and "Energy efficiency, electric mobility and emission reduction". All planning objectives listed in this question were selected by at least one authority confirming the relevance of objectives to the planning practice.

In the period "During the 2020/2021 Covid-19 lockdowns", the objective "Improve public transport system" remains the most popular one; but this time was selected three times less (9 authorities selected it); although the use of the public transport modes had been reduced during this period (Marra et al., 2021; Marsden et al., 2021; Nundy et al., 2021; Rothengatter et al., 2021; Vickerman et al., 2021), this finding is plausible, as this survey focuses on authorities and one of their responsibilities is the operation and resilience of the public transport systems. The objective, "Promote shared mobility, micromobility and MaaS" comes second (selected by 4 times more), while "Promote active mobility" comes third (selected by one more authority). "Improve safety, security, and resilience" comes in the fourth position, and "Optimise the available capacity and ITS" comes in the fifth place. "Integration of transport and urban planning", "Autonomous transport systems", "Urban Air Mobility" are the only planning objectives that were not selected at all. This indicates that authorities preferred to allocate all their resources on solutions that were already operational, instead of looking to solutions that have high uncertainty for the public and for all the stakeholders. Two authorities stated that no planning objectives were prioritised which highlights the diversity among planning mechanisms (or even existence of barriers) regardless of common needs.

The most noticeable change concerns the objective "Promote shared mobility, micromobility, and MaaS". Given the Covid-19 situation in 2020 (when vaccines were not available yet), citizens were reluctant to use public transport modes fearing of their safety (Song et al., 2021). The authorities anticipated these concerns and as such, they looked for alternatives to the second best option, this of shared mobility, micromobility and MaaS, trying as such to also refrain people from using private vehicles:

- *"If public transport is not ready for some general changes, then we could get support from external shared mobility operators and we feel that it could help us...They are more flexible for the changes [needed during Covid-19]. So, this was like a good opportunity to use these services [MaaS]."* [Katowice, POL; Large urban area; without SUMP]
- *"During Covid-19 we are working to create alternative solutions [to public transport] and one solution is to use shared mobility [e-scooter or cycling]."* [Turin, IT; Large urban area; with SUMP]

Another noticeable change, is the drop of the objective "Reduce private car usage and single occupancy vehicles" in the during 2020/2021 Covid-19 lockdowns, selected three times less for this period. It is anticipated that by prioritising other objectives like active transport, shared mobility, micromobility and MaaS, the authorities try indirectly to also reduce private vehicle usage.

A further analysis among small or medium sized areas (50,000-500,000 inhabitants) and large areas (>500,000 inhabitants) reveals different priorities for the period during the 2020/2021 Covid-19 lockdowns (Figure 2). Large areas focused a lot on "Promote shared mobility, micromobility and MaaS", while smaller areas focused on "Promote active transport". This is mainly due to the fact that the smaller areas do not have satisfactory transport mode alternatives (see Table 2) to direct citizens, and as such active mobility options

are the most promising ones. The second most frequently selected objective was to "Improve public transport system" for both smaller and larger areas.

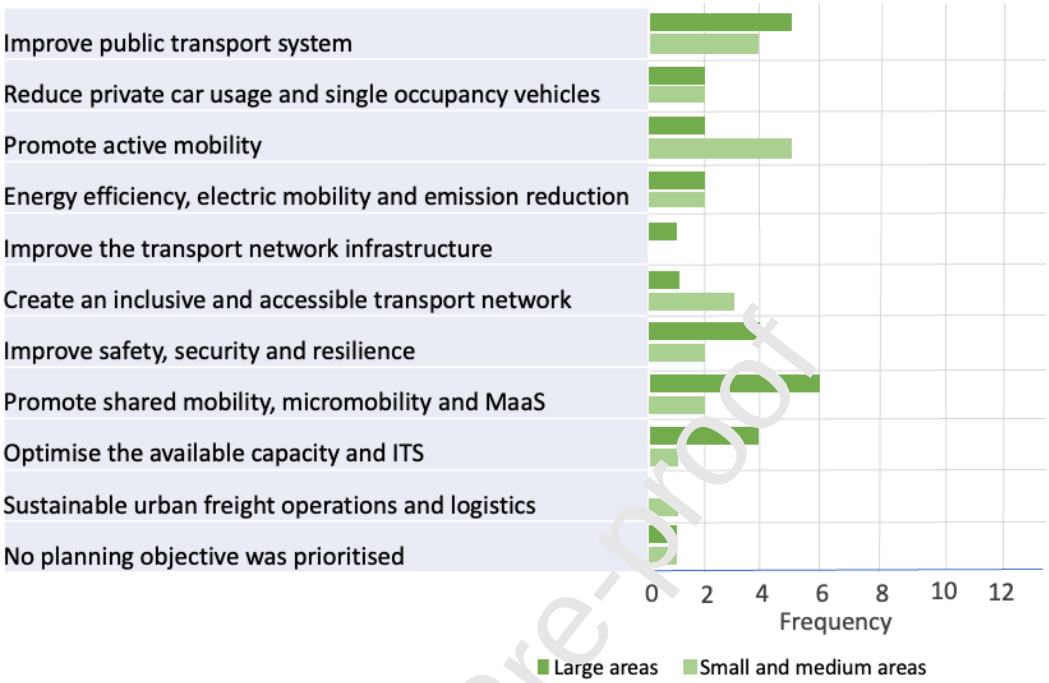


*Figure 2: Planning objectives during the Covid-19 outbreak in large and small/medium areas*

The comparison of the ranking of planning objectives between the period before and during the 2020/2021 Covid-19 lockdowns, results in the disclosure of the prioritised objectives (the planning objectives that were prioritised during the 2020 lockdowns), or the ones introduced for the first time (Figure 3). In total 9 planning objectives were prioritised or introduced out of the 13 presented in the given list. It is remarkable that almost half of the public authorities introduced or prioritised "Promote shared mobility, micromobility and MaaS". It is also revealed that "Promote active mobility" and "Improve safety, security and resilience" objectives have been ranked higher for the period during Covid-19, reflecting the need for securing public health, while at the same time promoting active travel which enables more keeping social distancing measures.

Another interesting finding is related to the objective "Create an inclusive and accessible transport network for all", which although selected by fewer authorities in the period during the 2020/2021 Covid-19 lockdowns, it was ranked higher by three authorities. This period of time, it was important for the authorities to act in a way that vulnerable population groups (i.e. elderly, disabled etc.) were not opted out from travelling when they needed to. Moreover, "Sustainable urban freight operations and logistics" objective was only prioritised once, although selected twice for the period during Covid-19. This fact contradicts with the increase of freight movements in urban areas which aim to make up for the reduced movements of people and market restrictions during the 2020-2021 lockdowns.

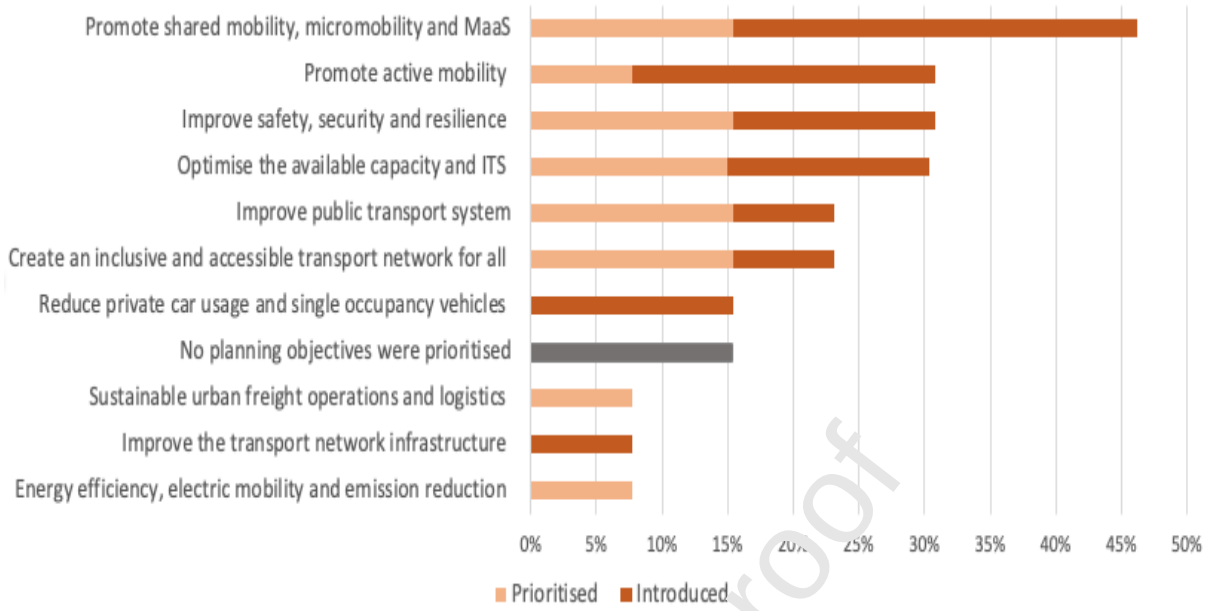


*Figure 3: Prioritised or introduced planning objectives during Covid-19 lockdowns*

**Planning actions to implement the prioritised objectives and driving forces behind**

This section explores the actions taken to implement the prioritised planning objectives (as presented in the previous section) and the driving forces behind them answering as such RQ2.

The respondents of the survey prioritised or introduced in total 9 planning objectives as presented in the given list (Figure 3). For each one of the prioritised objectives, the authorities specified one to three actions they took to achieve them, as well as the driving forces behind implementing these actions (Table 3). Looking to Table 3, it is interesting the variety of the actions the authorities implemented to achieve the same objectives. For example, in order some areas to promote shared mobility, micromobility and MaaS, tried to increase the supply of these services, while others found the opportunity to initiate e-scooter trials. There are also several similar actions that the authorities implemented to achieve their objectives. For example, in order to improve safety, several authorities imposed the installation/provision of sanitisers, the increase in the frequency of cleaning the vehicles, as well as wearing a mask on board (that applies to all transport modes). Social media was also widely utilised for the authorities to inform and engage the public.

However, it is also noticed that several of the implemented actions can achieve more than one objective. For example, by imposing traffic restrictions for private cars to improve safety or to promote active transport, at the same time the objective "Reduce private car usage and single occupancy vehicles" is also achieved. Similarly, by installing ITS (digital ticketing, real time information, digital counting) the authorities achieve both the optimisation of the available capacity, but also the improvement of the public transport system.

- *"Safety is one of the driving forces that has to be the focus right now, because somehow we have to gain trust from the passengers to make sure that they understand that public*

*transport vehicles are not dangerous or not more dangerous than visiting shops or markets."..."safety issues remain important also after Covid-19, because people will not think from one day to the other 'OK, it's over now we can get back to normal'."* [Aachen, DE; Large urban area; with SUMP]

- *"ITS system (mobile app) was created in order for people to know if the bus is full or not full (to know the occupancy)."..."Another measure to protect safety is the separate lanes for cyclists with lowering the maximum speed for cars, where lanes are common between cars and bikes."* [Turin, IT; Large urban area; with SUMP]
- *"A priority is given right now to active mobility, walking and cycling, since it is regarded as a safer solution and there has been a discussion to pedestrianise even more streets in the city for promoting and making safer and easier active mobility modes; so have more pedestrian roads, more cycling lanes and less cars."* [Trikala, GR; Small urban area; without SUMP]

| Prioritised objectives | Planning actions implemented | Driving forces / Wider objectives |
|---|---|---|
| **Promote shared mobility, micromobility, and MaaS** | Increase the supply of shared mobility services<br>*[Turin, IT; Katowice, POL]* | PH, ECON |
| | Mobility credits scheme* extended<br>*[West Midlands, UK]* | ENV, ECON, SE |
| | Initiate e-scooter trials<br>*[Middlesbrough, West Midlands, UK]* | PH, ENV, ECON |
| **Promote active mobility** | Promote active transport via local and social media<br>*[Athens, Trikala, GR; London, West Midlands, Oxford, Middlesbrough, UK; Graz, AU]* | PH, ENV |
| | Public engagement through social media campaigns<br>*[Athens, GR; Oxford, West Midlands, UK; Graz, AU]* | PH, ENV |
| | Temporary traffic restrictions to support active travel; Pedestrianisation<br>*[Trikala, GR; Katowice, POL]* | PH, ENV |
| | Widening footpaths<br>*[Middlesbrough, UK; Katowice, POL]* | PH, ENV |
| **Improve safety, security and resilience** | Prioritise public transport at traffic lights to reduce travel times<br>*[Turin, IT]* | PH |
| | Introduce telehealth instead of physically travel to the doctors/medical centres/hospitals<br>*[London, Oxford, West Midlands, UK]* | PH, SE, ENV |
| | Switching off all buttons for pedestrians at traffic lights to prohibit people touching interfaces<br>*[Katowice, POL]* | PH |
| **Improve public transport system** | Increase the level of safety on board by installing sanitisers, increasing the frequency of cleaning, making masks compulsory<br>*[Graz, AU; Flanders, BE; Athens, GR; Turin, IT; London, Oxford, West Midlands, UK]* | PH |
| | Increase number of buses to increase occupancy and satisfy social distancing measures<br>*[Aachen, DE; Athens, GR; Middlesbrough, UK]* | PH |
| | Introduction of demand responsive bus service | PH, ECON |

| | | |
|---|---|---|
| | *[Athens, GR; West Midlands, UK]* | |
| | Improve public transport accessibility<br>*[Athens, GR; West Midlands, UK]* | SE, PH |
| | Increase speed of rail-based public transport, enhance headways<br>*[Athens, GR]* | PH |
| **Optimise the available capacity & ITS** | Digital ticketing, digital passenger information systems, digital communication, Digital counting infrastructure at PT<br>*[Aachen, DE; London, West Midlands, Oxford, UK; Athens, GR; Turin, IT]* | PH, ECON, ENV |
| **Create an inclusive and accessible transport network for all** | Introduce more bus platforms and accessible buses<br>*[Athens, GR; Middlesbrough, UK]* | PH, SE |
| | Subsidised the PT tickets for vulnerable population and key workers<br>*[London, UK]* | SE, PH |
| | Secured grocery delivery slots for disabled and elderlies (one slot every week)<br>[*Oxford, West Midlands, Middlesbrough, UK*] | PH, SE |
| **Reduce private car usage and single occupancy vehicles** | Introduction of bus rapid transit<br>*[Athens, GR; West Midlands, UK]* | PH, ENV |
| | New bus lanes (car lanes dedicated to buses)<br>*[Katowice, POL]* | PH, ENV |
| | Reopening of rail stations that closed in the past<br>*[West Midlands, UK]* | PH, ECON |
| | Cooperation with shared mobility providers and ridehailing companies for free trips for medical staff<br>*[Katowice, POL; Oxford, West Midlands, UK]* | PH, ECON |
| **Improve the transport network infrastructure** | Roadworks, fix potholes, improve roadside infrastructure (it was an opportunity to fix potholes as the traffic on the roads was too low)<br>*[Oxford, UK]* | ECON, SE |
| | Improved and updated the operation of traffic lights<br>*[Oxford, Middlesbrough, UK]* | ECON |
| | Strengthened collaboration with other authorities for maximising transport assets<br>*[London, UK]* | ECON, ENV |
| **Energy efficiency, electric mobility and emission reduction** | Installing more EV charging points and incentivised electromobility<br>*[Trikala, GR; West Midlands, UK]* | ECON, ENV, SE |
| | Roll out of 300 electric buses through a leasing scheme<br>*[Athens, GR]*<br>*Roll out of electric buses [West Midlands, UK]* | ENV, ECON |
| ***Applies to all objectives*** | Covid-19 support funds<br>*[Aachen, DE]* | PH, ECON, ENV, SE |
| PH: Public Health, ECON: Economy, ENV: Environment, SE: Social equity<br>*Residents with an older, polluting car can exchange their car for £3000 of mobility credits. The credits can be spent on public transport, and other transport services such as car clubs, bikeshare, taxis and on-demand bus services. The credits are loaded in a pre-paid Debit card | | |

*Table 3: Actions adopted to accommodate prioritised planning objectives*

Out of the 29 actions specified (Table 3), it was stated that 19 were defined before the Covid-19 outbreak indicating that the pandemic has worked as an accelerator of objectives and measures already in place. As discussed during the interviews, the Covid-19 outbreak has favoured the promotion of sustainable transport modes (active and shared

mobility, micromobility and MaaS), and related actions came forward, using this crisis as an opportunity to implement them.

- *"All these directions were already discussed by the municipality before, but maybe they were accelerated by the pandemic."* [Trikala, GR; Small urban area; without SUMP]
- *"We're looking to try and jump on at the back of the Covid-19 pandemic opportunities that are available in terms of getting people around sustainable transport modes..."* [Oxford, UK; Small urban area; with SUMP]
- *"Covid-19 is an opportunity to bring forward some of the ambitions [related to the transport system] that had been around beforehand"…"It's more trying to probably accelerate some of the measures like active travel measures… "… "Covid-19 has sort of reinforced the importance of MaaS...is a good opportunity to bring people back to those services, or to use for new people."* [London, UK; Large urban area; with SUMP]
- *"Micromobility remains obviously important during Covid-19, because it's socially distanced mode of transport...there was a significant policy change in the micromobility trials which became available now … so we sort of took the opportunity."* [West Midlands, UK; Large urban area; with SUMP]

The driving factors or the wider objectives for authorities changing their priority in planning objectives vary. Taking into account all the objectives that were prioritised during the lockdowns, it is found that the main reasons for prioritising specific objectives was public health and safety (35% of the prioritised objectives), followed by reducing environmental impact (27%), support economic recovery (21%) and secure social equity (15%). As it can be seen in Table 3, the implementation of most of the actions had as a driving force the protection of public health. However, the authorities tried to make sure that the actions, can cross at the same time and other reasons, such as the economic recovery, the protection of the environment, and social equity.

- *"The focus of whatever we do is, well, public health and safety."* [Oxford, UK; Small urban area; with SUMP]
- *"We've had to look at alternative sustainable options of how we can get people around based on supporting the local economy. So, we have basically commenced an electric scooter trial."* [Middlesbrough, UK; Small urban area; with SUMP]

**Emergency planning**

The analysis continues with exploring if the authorities have been prepared for dealing with emergency situations and if emergency planning is part of their strategic planning (the Sustainable Urban Mobility Plan). The results reveal that emergency planning for a pandemic and any emergency situation in general, is not part of the planning mechanisms and the strategic frameworks (SUMP) of the authorities. Five of the participant authorities stated that there is no emergency planning, and the other five were unsure about the existence of any. Only the UK authorities mentioned that there is emergency planning for the public transport system in the case of terrorism incidents (e.g. evacuation etc.). Two authorities mentioned that emergency scenario planning exists for other sectors, such as business continuation plans for dealing with terrorist attacks. Just one authority mentioned that since the Covid-19 breakout, they created an official synergy with stakeholders to adopt tools and

techniques from other sectors' emergency scenario planning as a response to the Covid-19 crisis.

- *"No, we haven't had an emergency planning before. I'm pretty sure that on a city level there is…but not focusing on our sector [transport]. "…"I don't think that there has been a detailed or focused analysis on what to do in crisis situations."* [Aachen, DE; Large urban area; with SUMP]
- *"We have developed something during the pandemic, that is the regional Transport Coordination Centre...We bring together a lot of different agencies to look at live situations that are happening on the network, but also plan ahead."* [West Midlands, UK; Large urban area; with SUMP]

The lack of emergency planning, has led to a situation where all the authorities followed reactionary approaches. At the same time, six authorities stated that they were sharing knowledge with other cities or areas to fill knowledge gaps about how to respond towards the Covid-19 lockdowns.

- *"It was very much local knowledge as opposed to a strategy…it was the opinions and the thought process of the local people as opposed to a strategy that came. Place for that is very reactionary."* [Oxford, UK; Small urban area; with SUMP]
- *"Covid-19 is being very reactionary, so if anything, there's been no real strategy behind it. It's been kind of local knowledge and thought processes that have got into it, but no real strategy as such."* [Middlesbrough, UK; Small urban area; with SUMP]
- *"We are doing more ad hoc actions now, looking at the requirements that we see in the horizon."* [Aachen, DE; Large urban area; with SUMP]
- *"We have counselled with other cities to get insights about their reactions …to start thinking how to do it in a similar way and we realised that cities are not ready…haven't thought about it previously."* [Katowice, POL; Large urban area; without SUMP]

Authorities stated that it is somehow impossible to think about introducing emergency scenario planning during the lockdowns. However, they mentioned the need to include it in the next iteration of their strategic documents either as a reference to resilience or as lessons learned from the pandemic, or to include it in the scenarios specification (to define emergency scenarios).

## RECOMMENDATIONS

**Strengthening SUMP planning phases to support a more resilient planning environment**

Given the challenges the authorities faced during the 2020/2021 lockdowns, as well as the identified gaps in emergency scenario planning, it is recommended emergency planning scenarios to be incorporated in some steps of the Sustainable Urban Plan framework (SUMP; or in the strategies). The nature of emergency is urgent and acting urgently involves risks due to the lack of time for proper planning. Planning on an ad-hoc basis overlooks planning implications relevant for the long term. And this is where emergency planning as part of strategic planning is important.

The SUMP framework consists of 12 steps that are grouped into four planning phases[7]: 1. Preparation and analysis, 2. Strategy development, 3. Measure planning, and 4. Implementation and monitoring (each group consists of 3 steps; total 12 steps). Together with the participant authorities in our survey, we discussed each of the four categories to identify what needs to be added in the preparation of their SUMP in the future, to support them to deal with emergency situations, such as the Covid-19 pandemic. In this case, authorities can be prepared to tackle emergency situations and not just react when one comes. For each of the four planning phases, we discussed the barriers and the opportunities they faced since the Covid-19 outbreak, we recorded them, and based on these, we identified recommendations that can be added to assist emergency scenario planning in the future. Table 4 below presents the identified barriers and the recommendations for enhancing each planning phase of the SUMP framework, answering as such RQ3.

| SUMP phase | Identified barriers | Recommendations |
|---|---|---|
| Preparation and analysis | Lack of data (especially detailed qualitative) about citizens' behaviour and requirements | Include in the planning requirements emergency scenarios – Step 2 of SUMP |
| | Lack of data from all modes – integrated data platforms | Consider establishing a knowledge exchange with other national and international cities (not only with other departments and organisations) – Step 2 of SUMP |
| | No or very specific emergency situations have been analysed | Include in the analysis, not only modes, but citizens detailed requirements (combination of and qualitative data) – Step 3 of SUMP |
| Strategy development | Most of the developed scenarios are business as usual (no scenarios about economic recession, terrorist attacks, pandemics etc.) | The development of scenarios should be detailed about the population groups, the modes, the geography, the timing – Step 4 of SUMP |
| | The scenarios and the according descriptions are usually high level and lack detail | Scenarios about emergency situations should also be included – Step 4 of SUMP |
| | There are no scenarios for resilience/recovery | Each specified scenario should also be followed by resilience scenarios – Step 4 of SUMP |
| | Indicators and measurable targets usually focus on the environment and economy, while indicators for society and public health (that are usually more qualitative) are missing or are few | Include (more) indicators about society and public health; even if they are qualitative – Step 6 of SUMP |
| Measure planning | Measure packages do not refer at all to emergency situations | Measure packages should also be in place for emergency scenarios – Step 7 of SUMP |
| | Lack of detailed actions description | Detailed description of actions as well as action from emergency scenarios – Step 8 of SUMP |
| | Limited funding available for emergency situations | Financial planning should also include securing finance for tackling and recovery from emergency situations – Step 8 of SUMP |
| Implementation and monitoring | Lack of data that enable monitoring and re-evaluation of strategies | Data sharing requirements and data formats should be included in the contracts with transport and other |

[7] https://www.eltis.org/mobility-plans/sump-process

| | | |
|---|---|---|
| | | operators. – Step 10 of SUMP |
| | Inability of merging datasets and identify/monitor behaviour of citizens and modes' performance due to constraints in data sharing agreements | Citizens should not only be informed, but monitored as well - Step 11 of SUMP |
| | Difficulty in measuring the impact of emergency planning measures as the baseline is not clear | |
| | Citizens behaviour and requirements should also be monitored; not only the performance of the transport modes and the network. | |

*Table 4: Barriers faced in planning during the 2020/2021 Covid-19 lockdowns & recommendations for enhancing the SUMP framework*

A thematic analysis of the barriers discussed reveal two main concepts that authorities struggled with during the implementation of what has been included in their SUMP strategy, that hindered also their emergency planning. These two topics are: scenarios and data. Both concepts apply to normal situations (business as usual), but they become even more important during an emergency situation as the authorities do not have a solid base to support their urgent decisions.

### Scenario development

Scenarios is the word that was mentioned most often in the interviews with the authorities. Several authorities mentioned that the scenarios they have in place are not enough, they mainly include business as usual lacking scenarios about emergencies, and that the information they provide is high level/not detailed hindering them from implementing actions, and even more emergency actions:

- *"Most of the schemes and the policy is more ad hoc: something comes up as a problem and they try to cope with it and go further…there is no planning…there's only one future forecast scenario and it's business as usual: do nothing and see what happens."* [Flanders, BE; Large urban area; with SUMP]
- *"We found quite useful an approach recently which is looking at scenario planning in some of the early stages… taking more of an approach where we accept that there's a large degree of uncertainty in the futures that we might see and that we need to design policies and measures that will be resilient to those different scenarios that might take place."* [West Midlands, UK; Large urban area; with SUMP]
- *"Most of the schemes and the policy is more ad hoc: something comes up as a problem and they try to cope with it and go further…there is no planning…there's only one future forecast scenario and it's business as usual: do nothing and see what happens."* [Turin, IT; Large urban area; with SUMP]
- *"The strategies and scenarios in place, I don't think that there are necessarily to the [desired] level of detail and reliability."* [Oxford, UK; Small urban area; with SUMP]
- *"There is no resilience plan about the strategy development and even about measure planning."* [Katowice, POL; Large urban area; without SUMP]

- *"Focusing on measures to be taken in situations like we experience currently, is something that we do nowadays more on an ad hoc basis, and this might not be the best way of acting."* [Aachen, DE; Large urban area; with SUMP]
- *"…, the challenge of baselining; what we're doing at the moment during Covid-19, and our traditional scenario evaluation approaches, which have been very much to take baseline measurements, introduce an intervention and then see what the effects of that have been relative to baseline doesn't really mean very much at the moment."* [West Midlands, UK; Large urban area; with SUMP]

The lack of detailed scenarios and emergency scenarios concerns three out of the four SUMP phases: the Strategy and development, the Measure planning and the Implementation and monitoring. The recommendation is that scenarios should be specified in greater detail in the Strategy development phase, in order to be able to be measured and monitored in the following phases. In addition, scenarios about emergency incidents should be included in the scenario specification phase of SUMP (see Table 3 for specific recommendations).

### Quality and type of data

Data was also frequently mentioned during the discussions for the all the four SUMP phases. It was discussed that the most difficult is to get access to data about citizens behaviour and preferences, and that not only quantitative, but qualitative data is also needed from the very first planning phase of SUMP. In addition, it was mentioned that qualitative data is needed for measuring social and public health related indicators. Furthermore, some authorities mentioned that although there is data in place, it is usually difficult to merge datasets due to different formats and lack of interoperability. As such, it is difficult to derive insights about citizens travel behaviour. Some authorities that do not have satisfactory ITS mechanisms in place, they even lack significant data for the transport modes and the network hindering not only their proper planning, but also emergency planning.

- *"Applying some temporary solutions…we are on this 'observation' phase…"there is lack of knowledge and data on the operational level."* [Katowice, POL; Large urban area; without SUMP]
- *"The most important thing that we should do is actually to monitor what's going on in order to re-evaluate our schemes, but data is not satisfactory to do so."* [Athens, GR; Large urban area; with SUMP]
- *"What we sometimes are missing is merging and fusing these data sources to find information that will give us insight to [travel] behaviour." "…we have good data, but they're all very disjointed."* [Oxford, UK; Small urban area; with SUMP]
- *"More of an emphasis on qualitative approaches and data to try and uncover the reasons why people's behaviour has changed (not only focused on individuals), and what and how, and explore that in a bit more detail."* [London, UK; Large urban area; with SUMP]
- *"stakeholders and citizens engagement and the qualitative insights we get from them is also a key enabler, so that we should do this (the engagement) in the whole process."* [Trikala, GR; Small urban area; without SUMP]

The SUMP steps are usually quite technical depending on quantitative data. But it is important for authorities to also collect qualitative data about citizens, as well as include qualitative indicators for measuring the performance of urban mobility (see Table 3).

## CONCLUSION

The objective of this paper was to investigate how the transport planning objectives changed during the 2020/2021 Covid-19 lockdowns, the actions taken to achieve the objectives during this period, as well as the gaps of authorities in emergency planning. In addition, it identified the barriers the authorities faced during this period, and provided recommendations for enhancing the SUMP framework with emergency planning aspects. The findings and recommendations are derived following the analysis of a number of interviews from specific public authorities in Europe, however, they can be interpreted and applied for similar urban mobility settings.

Regarding objective 1, the results demonstrated that the Covid-19 crisis has an apparent impact on the prioritisation of planning objectives in European public authorities. The response to the pandemic involved mostly actions that were readily available and defined before the Covid-19 outbreak. The results of the prioritisation of objectives reveal that the response to the pandemic involved objectives, which relate to smaller scale interventions or those established longer in the planning environment offering an opportunity to react fast in the crisis and involving lower risk or uncertainty in the implementation phase. For example, measures related to active mobility or shared mobility and MaaS seem more appropriate to deal with the crisis as opposed to less explored urban mobility solutions such as autonomous transport systems or Urban Air Mobility. In the same manner, transport and urban planning integration was not considered during the lockdowns period, as this practice entails a long timeframe to be realised. At the same time, the crucial factor of human safety has provided an advantage to trips performed individually such as those by bike or walking, while supporting the underlying vision of car usage reduction. The preference of active mobility solutions in smaller areas as opposed to shared mobility in larger areas is also pointing out the preference to more mature and readily available interventions, considering that shared mobility is more advanced in the larger areas participated in the study.

Regarding objective 2, the authorities implemented a variety of measures and actions to achieve their prioritised objectives. Although each public authority is unique with specific needs and capabilities, several common measures and actions were identified as potential contributors towards a more resilient planning environment. It is evident that the pandemic has provided great grounds for existing or new active mobility initiatives to move forward (Nurse & Dunning, 2020), overcoming in many cases barriers established long in the urban environment. It remains however uncertain if the adopted measures are going to last and for how long. Given the environmental crisis and the rising awareness on health benefits around active mobility, the observed changes in travel patterns during the pandemic might indeed stay long. On the other hand, and in accordance with the personal views of public authorities of this study, although Covid-19 offers an opportunity to promote active transport, people might go back to private vehicles after the lockdowns.

Regarding objective 3, emergency planning should be embedded in the SUMP process to strengthen future responsiveness to unforeseen scenarios. Communication channels between different levels of the planning process need to be enhanced, to ensure smooth collaboration among stakeholders. Availability of both quantitative and qualitative data, and integrated data sets can also provide valuable insights for dealing with crisis, when time constraints are imposed.

For future research, it would be interesting a follow up research to be conducted, to explore which of the measures and actions the authorities maintained after the period we explored in this paper, when the lockdowns stopped due to the availability of vaccines and the knowledge that the community has about this pandemic. Recording the lessons learned from the authorities over different time periods of the pandemic is valuable for tackling future emergency situations.

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## Appendix: Questionnaire

| Question | Response options / (Explanatory text) |
|---|---|
| **Section 1: Introduction and Consent** | |
| **I confirm that I have read and understood the above statements:** | Yes<br>No |
| **Section 2: Stakeholder details** | |
| **Please select the type of organisation you work for:** | Public authority<br>Private mobility service provider<br>Freight transport operator<br>Transport services integrator or MaaS operator<br>Technology / Data provider<br>Infrastructure operator<br>Construction, real estate and investment company<br>Research institute or academia<br>Association or lobby<br>Other (please specify) |
| **What is the size of the organisation you work for?** | Micro (<10 employees)<br>Small (10-49 employees)<br>Medium (50-249 employees)<br>Large (>250 employees) |
| **What is the name of the department you work for?** | |
| **Which country do you work in?** | 51 countries in Europe + Other (please specify) |
| **Please indicate your age:** | 18 - 24<br>25 - 34<br>35 - 44<br>45 - 54<br>55 - 64<br>More than 64<br>Prefer not to answer |
| **Please indicate your gender:** | Male<br>Female<br>Other<br>Prefer not to answer |
| **Section 3: Planning and Decision-making Objectives** | |
| **For which city/area are you going to provide insights about transport planning below?** | |
| **Please indicate the type of this city/area:** | Rural area (<5,000 inhabitants)<br>Small or medium town (5,000 - 50,000 inhabitants)<br>Small urban area (50,000 – 200,000 inhabitants)<br>Medium-size urban area (200,000 – 500,000 inhabitants)<br>Metropolitan area (500,000 – 1,500,000 inhabitants)<br>Large metropolitan area (> 1,500,000 inhabitants) |
| **Please rank the top 5** | Promote active mobility |

| | |
|---|---|
| **urban and transport planning policy objectives within your area the last 5 years before the Covid-19 outbreak.**<br>**Please focus on objectives (policy planning priorities) and not actions/measures which relate to the implementation part of objectives at a later planning phase.** | Improve public transport system<br>Improve safety, security and resilience<br>Optimise the available capacity and ITS<br>Reduce private car usage and single occupancy vehicles<br>Promote shared mobility, micromobility and Mobility as a Service<br>Create an inclusive and accessible transport network for all<br>Urban Air Mobility (passenger or freight)<br>Transport and urban planning integration<br>Improve the transport network infrastructure<br>Autonomous transport systems<br>Sustainable urban freight operations and logistics<br>Energy efficiency, electric mobility and emission reduction<br>Other objective (please specify) |
| **Please rank the top 5 objectives since the Covid-19 outbreak.** | Promote active mobility<br>Improve public transport system<br>Improve safety, security and resilience<br>Optimise the available capacity and ITS<br>Reduce private car usage and single occupancy vehicles<br>Promote shared mobility, micromobility and Mobility as a Service<br>Create an inclusive and accessible transport network for all<br>Urban Air Mobility (passenger or freight)<br>Transport and urban planning integration<br>Improve the transport network infrastructure<br>Autonomous transport systems<br>Sustainable urban freight operations and logistics<br>Energy efficiency, electric mobility and emission reduction<br>Entry value of 'Other objective (please specify)' specified in previous Q<br>Other new objective #1 (please specify)<br>Other new objective #2 (please specify)<br>Other new objective #3 (please specify)<br>No planning objectives were prioritised or introduced due to the Covid-19 outbreak |
| **What are the reasons that triggered the prioritisation or the introduction of new planning objective(s) since the Covid-19 outbreak? Please, select all that apply.** | Public health<br>Economic recovery<br>Environmental impact<br>Social equity<br><br>Other (please specify) |
| **What is the planning timeframe of the prioritised or new objective(s)?** | Temporary (only during Covid-19)<br>Tactical level (1–3 years)<br><br>Strategic level (> 3 years) |
| **Has the Covid-19 outbreak provided an opportunity to your city/area to promote active transport policies that will be retained and after the outbreak?** | Yes<br><br>No |
| **Did your city/area do any** | Yes |

| | |
|---|---|
| **emergency planning test for a pandemic or a similar emergency situation before the Covid-19 outbreak?** | No<br>I am not sure |
| **Has your city/area shared knowledge with any other city/area to fill knowledge gaps about Covid-19?** | Yes<br>No<br>I do not know |
| **Who was engaged for adopting changes in planning priorities due to Covid-19? Please, select all that apply.** | Government<br>Health experts<br>Emergency services (police)<br>Citizens<br>Private sector<br>Academia<br>Other |
| **Does your city/area carry out any of the following activities during the different phases of transport planning process? If yes, during which planning phases (in general and during the Covid-19 outbreak)? Please, select all that apply.** | Preparation and analysis phase<br>Strategy development phase<br>Measure planning phase<br>Implementation and monitoring phase<br>Covid-19 emergency planning phase<br>N/A |
| **Has your planning environment provided flexibility to mitigate the impacts of the Covid-19 outbreak?** | Yes<br>Somehow<br>No |
| **How would you describe the working relationship between emergency planning level and implementation level?** | Very good<br>Good<br>Neither good nor poor<br>Poor<br>Very poor |
| **Which phase(s) of the planning policy you think should be strengthened to increase resilience?** | Preparation and analysis<br>Strategy development<br>Measure planning<br>Implementation and monitoring<br>Other (please specify) |
| **For how long do you estimate the impact of Covid-19 will continue affecting the urban and transport planning environment in your area?** | Less than 1 year<br>1-3 years<br>More than 3 years<br>Do not know |

| Section 4: Actions for prioritised or new objectives due to COVID-19 | |
|---|---|
| **Please specify the top three actions/measures in place for achieving the prioritised or new objectives defined previously. (examples of actions related to 'Improve public transport system' objective may include digitalisation of services, increase of vehicle fleet to tackle capacity constraints, provision of hand sanitisers dispensers etc.)** | (Actions of prioritised or new planning objectives: Action 1, Action 2, Action 3) |
| **Please indicate if the action of the prioritised or new objective(s) was defined before or if it was developed as a result of the Covid-19 outbreak.** | Defined before Covid-19<br>Defined due to Covid-19 |
| **Have you used any of the following methods to assess the expected impact of the action(s) taken due to the Covid-19 outbreak? Please, select all that apply.** | Expert judgment<br>Comparative or analogous estimation (with similar past actions)<br>Top-down method (high-level work breakdown)<br>Bottom-up method (detailed work breakdown)<br>Parametric model estimation<br>The expected impact of the action was not assessed<br>Other (please specify) |

## CRediT author statement

**Maria Kamargianni:** Conceptualisation, Methodology, Formal analysis, Writing the revised manuscript, Rebuttal letter, Funding acquisition. **Christina Georgouli**: Conceptualisation, Methodology, Validation, Formal analysis, Investigation, Resources, Writing - Original Draft, Review, Supervision, Project administration **Luciano Pana Tronca:** Conceptualisation, Methodology, Validation, Investigation, Writing - Original Draft. **Manos Chaniotakis:** Review & Editing

**Declaration of interests**

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

☐The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

**Highlights**

- Covid-19 had an apparent impact on the prioritisation of planning objectives
- The response to the pandemic involved mostly actions that were readily available
- The pandemic has acted as an accelerator of specific existing planning objectives
- Active travel measures were preferred over more advanced mobility solutions
- Response to the pandemic revealed lack of emergency planning and preparedness