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Evaluating the public acceptance of sustainable mobility interventions responding to Covid-19: The case of the Great Walk of Athens and the importance of citizen engagement

Charalampos Kyriakidis\textsuperscript{a}, Ioannis Chatziioannou\textsuperscript{a}, Filippos Iliadis\textsuperscript{a}, Alexandros Nikitas\textsuperscript{b,*,}\textsuperscript{a}, Efthimios Bakogiannis\textsuperscript{a}

\textsuperscript{a} Department of Geography and Regional Planning, School of Rural and Surveying Engineering, National Technical University of Athens (NTUA), 9 Heron Polytechniou Str., Zographou Campus, 15780 Athens, Greece
\textsuperscript{b} Department of Logistics, Marketing, Hospitality and Analytics, Huddersfield Business School, University of Huddersfield, Queensgate, HD1 3DH Huddersfield, UK

\textsuperscript{*} Corresponding author.
E-mail address: a.nikitas@hud.ac.uk (A. Nikitas).

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ABSTRACT
COVID-19, the most wide-spread and disruptive pandemic in over a century, enforced emergency urban design responses meaning to recalibrate transport provision globally. This is the first work that systematically evaluates the ‘public acceptance’ as a proxy for ‘policy success’ and ‘potential for longer-term viability’ of the high-profile sustainable transport intervention package introduced in 2020 in the capital city of Greece known as the Great Walk of Athens (GWA). This is achieved through a twin statistical analysis of an e-survey that looked into the attitudes and urban mobility experiences of Athenians accessing the area of the trial daily. The research enabled a comparison between the pre- and post-implementation traffic situations and provided details about specific measures packaged in the GWA project. Our results suggest that walking and cycling uptake were only marginally improved. Traffic delays for car users were considerable. Car usage declined somewhat, with the exception of ride-sharing. Public transport ridership numbers suffered a lot because of concerns about sharing limited surfaces for pedestrian movement (Nguyen et al., 2020; Nurse & Dunning, 2020; Tribby & Hartmann, 2021) and an overall decreased value of public space (Jasinski, 2021; Tian et al., 2020) emerged as critical problems in the pandemic that jeopardised the value of the compact city model (Rocklöv & Sjödin, 2020). The need for action did not allow for extensive theoretical publications on the issue (Ghosh et al., 2020) but in practical terms, a series of interventions in many

1. Introduction

COVID-19 is an on-going pandemic that has quickly spread worldwide through human-to-human transmission (Kruse, 2020) and has reconstructed the very nature of mobility demand and supply (Nikitas, Tsigdinos, et al., 2021). From its beginning, various restrictive measures have been activated globally to limit the virus diffusion by reducing human interaction within the cities (Liu et al., 2021; Politis, Georgiadis, Kopsacheilis, et al., 2021). During that period, a dialogue has begun on whether urban planning should still prioritise the concept of the ‘compact city’ since dense cities may promote unintentionally the virus transmission (Hamidi & Zandiatashbar, 2021; Mouratidis & Yiannakou, 2021; Rocklöv & Sjödin, 2020). Increased population concentration as a result of design standards that control urban sprawl trends (Barbopoulos et al., 2005; Rodi, 2012), modal shift measures to support public transport usage and reduce car travel (Connolly et al., 2020; Goscé & Johansson, 2018; Lee et al., 2020; Nikitas et al., 2018), along with limited surfaces for pedestrian movement (Nguyen et al., 2020; Nurse & Dunning, 2020; Tribby & Hartmann, 2021) and an overall decreased value of public space (Jasinski, 2021; Tian et al., 2020) emerged as critical problems in the pandemic that jeopardised the value of the compact city model (Rocklöv & Sjödin, 2020). The need for action did not allow for extensive theoretical publications on the issue (Ghosh et al., 2020) but in practical terms, a series of interventions in many
cities worldwide were utilised to provide immediate urban transport solutions and reassure those who had questioned the compact city.

Researchers (Angell & Potoglou, 2022; Bakogiannis et al., 2020; Bereitschaft & Scheller, 2020; Campisi et al., 2020; Fischer & Winters, 2021; Nikitas, Tsigdinos, et al., 2021; Soto et al., 2021; Vecchio et al., 2021) underline typical examples of temporary interventions that took place in many cities in order to “flatten the curve”. Those measures may be categorised into two main groups aiming to: (a) enhance walking and (b) enhance cycling. In particular, these interventions, in line with the advice of the World Health Organization (WHO, 2020), included complete pedestrian walkways, sidewalk widening, facilitation of pedestrian crossings, the development of new bike lanes and parking space and free bike-sharing access. Such interventions are not only capable of allowing pedestrians to keep appropriate distances within cities - and thus allowing the implementation of sanitary protocols at urban level - but also, do not subvert the core of the compact city model, associated with pedestrian movement, the use of alternative sustainable means of transportation (bicycle and micromobility) and socialisation (Gehl, 2013). Barbarossa (2020, p. 3) observes that this mega health crisis “has strictly connected mobility, urban spaces and health, highlighting the need to act immediately in transforming cities through new sustainable transport models”. Thus, although there are researchers (Askarizad et al., 2021; Gill et al., 2020) that disagree to such a view, the outbreak seems to have had a positive impact on urban planning strategies as the implementation of specific urban renewal plans has been accelerated.

This work focuses on urban mobility intervention packages set to control COVID-19 and support transport resilience on the one hand and (indirectly) promote transport decarbonisation initiatives on the other. Setting Athens, Greece as our local case study, we attempt to understand the extent to which the high-profile transport initiative Great Walk, (i.e., a ‘quick-fix’ pilot road space re-arrangement programme) impacted the centre of the city by replacing car traffic lanes with pedestrian zones, cycling routes and bus lanes and how these changes affected locals' travel behaviour. By answering this question, we can develop a better understanding on whether urban mobility design interventions can improve preparedness for future epidemics by improving the way cities provide sustainable and resilient transport. It should be noted that the interventions implemented in Athens did not include a public consultation planning process. Taking into account that local authorities plan to make those interventions (or parts of them) permanent, this paper evaluates their success in public acceptance and user experience terms. Findings can contribute to developing wider conclusions concerning the degree to which: (a) these specific interventions can impact on changing the public's travel behaviour; (b) citizens' previous mobility habits may influence future ones and (c) a pilot project that aggressively rebalances road space in favour of active and public transport can be widely accepted.

After a brief scene-setting literature review, our statistical data processing techniques are presented in Section 3 of the paper. The analytical procedure is summarised in Section 4, followed by a discussion in Section 5 and conclusions in Section 6.

2. Literature review

2.1. Street network redevelopment as a sustainable mobility measure

Urban transportation systems are complex networks shaped by various geographical, social, economic, and environmental factors (Wang et al., 2008) and at the same time very dependent on the road infrastructure hosting them (Aljoufie et al., 2013). These systems and their respective road networks have a significant role in defining urban development and are the epicentres of our cities today. Many of the travel eco-system interventions over the years have been large-scale government-promoted expansion projects (Dixon & Tewdwr-Jones, 2021) and tend to be extensive, expensive and of a radical nature with focus on traffic reduction.

A significant number of interventions, however, also involve softer designs. In these cases, emphasis was placed on improving the existing urban fabric while maintaining the building inventory of the city. This option is not significantly different from a recently emerging trend according to which urban renewal strategy and design are applied in specific public spaces of a city through the implementation of a Sustainable Urban Mobility Plan (SUMP). With an emphasis on road sections, this trend is based upon: (a) the need to transform public space into urban sections friendly to sustainable mobility and (b) to modify the theoretical concept at an urban planning level: from the visual-aesthetic and social-functional traditions to the place-making ones (May, 2015).

Roads are essential components of cities since: they shape them and facilitate their structure (Ghahramanpouri et al., 2012); they give morphological features (Scorza & Fortunato, 2021) and are places where human activities take place (Kyriakidis, 2021); they create cities’ character and substance (Turgut, 2021) justifying the methodological approach Cullen (1961) proposed. Sustainable mobility planning refers to the individual characteristics of roads that include not only the motorised traffic zone but also the pedestrian zone as well as the elements of urban equipment and decoration (Bakogiannis, Siti, Christodouloupoulos, et al., 2019).

Although sustainable mobility projects are typically considered as part of soft and small-scale interventions mainly focusing on aesthetics, in practice, they are the outcome of a deeper process. Their goal is to create a new resource-efficient ethos in transport provision (Nikitas et al., 2019), promote social equity (Zhao & Yu, 2020), support environmental preservation (Alyavina et al., 2020), boost economic efficiency (Canitez, 2020) and introduce people-centric and holistic policy practices genuinely applicable to cities (Sdoukopoulos et al., 2019). Indeed, in such projects, motor traffic is usually re-organised and emphasis is set on public transport and non-motorised mobility (cyclists and users of micromobility) while pedestrian movement is strengthened. Through sustainable mobility interventions “a street as a road becomes a street as a space” (Jordov & Brňová-Foltynová, 2021) and “the road network functions as a toolkit for positive city transformation” (Tsigdinos et al., 2022). In that way, safety and security levels may be increased; the same happens to sociability levels, as Francis (2016) confirms with a study on active citizenship in public spaces.

The reason why we have focused on such interventions is because, during the last decade, they are widespread in many European countries as a measure to prioritise people over cars and help addressing climate change (Rye & Hrelja, 2020) and have become more critical than ever before because of their suitability in the Covid-19 crisis (Nikitas, Tsigdinos, et al., 2021). In Greece several such projects were materialised, not only in metropolitan areas but also in medium-sized cities. In most cases, the main goal of such a road space programme had to do with enhancing active travel mode movement and improving the exposure of important city landmarks. In general, public consultation is crucial during the systematic and slow-paced SUMP implementation but Covid projects were governed by a different and atypical narrative.

2.2. Street network redevelopment response measures to Covid-19

COVID-19 has been an unprecedented game-changing disruptor for cities. Governments and authorities around the globe were prompted to impose restrictions on mobility at an unparalleled scale and magnitude (Jenelius & Cebecauer, 2020) meaning that no sector has been more critically impacted by the pandemic than that of transport (Politis, Georgiadis, Papadopoulos, et al., 2021). Local and national lockdowns, physical spacing, business and school shut-downs, social mixing restrictions, face covering mandates, self-isolation measures, remote working prioritisation and stay-at-home guidelines imposed a new transport reality prioritising the need for safety (Nikitas, Tsigdinos, et al., 2021). One of the most transformative and infrastructure-based policy responses to Covid-19 by transport providers was the immediate short-term investment on street redesign projects (Koehl, 2020) to
promote active travel modes (Scorrano & Daniellis, 2021) and the establishment of 15-min city approaches where the majority of residents are able to access their key destinations via 15-min cycling or walking trips (Guzman et al., 2021; Pozoukidou & Chatziyiannaki, 2021). This is because active transport modes have a unique ability to provide a socially distanced way of moving that helps avoiding overcrowding and closed spaces.

COVID-19, actually brought to the surface underlying design and planning issues (Shorthall et al., 2021) that were accumulated by a century-long, one-dimensional, car-centric urban development philosophy (Nikitas, 2019) and provided a short-window of opportunity to make changes that could help improving a new city travel ethos (Dingil & Esztengar-Kiss, 2021) better aligned with transport decarbonisation practice (Alyavina et al., 2022). Massive motor traffic space allocation with little emphasis on public transit, narrow streets and sidewalks, undermining cycling and walking infrastructure and car-dictated regulations were such problems (Nikitas, Tsigdinos, et al., 2021); all of them potentially addressable, to some degree, by Covid-induced street redevelopment projects replacing car traffic lanes with pedestrian zones, cycling routes and bus lanes. Many cities thus designed fast-track SUMP-minded intervention road projects in line with the 15-min city approach to make it easier for people to walk and cycle (Cusack, 2021; De Vos, 2020; Gaglione et al., 2022). Most of these were pilot measures aiming to limit car traffic congestion, maintain low speeds and prioritise active travel (Basu & Ferreira, 2021). Early findings reveal that the compact city as a model for sustainable urban planning and policy as tested by COVID-19 has serious room for improvement (Mouratidis, 2022) and transport intervention could be a major pillar for this provided that it is user-centric or at the very least publicly acceptable. The latter is highlighted because the urgency to deal with Covid-19 timely created a sense that urban mobility interventions may be implemented in an instantaneous fashion without people's participation in the design process and approval.

2.3. People participation in street redevelopment projects

Nowadays, although planning theories have changed their orientation (see Wilson et al., 2017), it is not easy to achieve a significant degree of people involvement in urban planning processes (Falco & Kleinans, 2018; Holman & Rydin, 2012; Münster et al., 2017), mainly because of: (a) lack in participatory culture (Chatziioannou et al., 2020), (b) bureaucracy (Brabham, 2009), (c) use of wooden language (Wilson et al., 2017) and (d) the loss of public trust in local authorities (Giering, 2011). Even if the situation concerning specific such causes seems to be better in the post-pandemic period (i.e., bureaucracy is much more limited due to the development of specific electronic governmental apps) the loss of trust in politicians and the media is bigger.

SUMPs' implementation is mainly related to community engagement (Arsenio et al., 2016; Banister, 2008; Le Pira et al., 2020; Okraszewska et al., 2018), which should not be limited to opinion-raising on social consensus related to interventions but it could be extended to other activities, like data collection (Somarakis & Stratigea, 2014). Indeed, such a philosophy is now widespread across Europe (Bakogiannis et al., 2021), as new technologies urged such techniques to be applied. Data collection processes also include users' evaluation regarding an urban design proposal, as it has already taken place in many cases across Greece (Bakogiannis, Siti, Tsigdinos, et al., 2019; Delitineou et al., 2019). Such an evaluation may also take place through pilot interventions; they may be held either as autonomous actions (i.e., part of a mobility week event) or as a coping plan to face emergencies, like the COVID-19 outbreak. In both cases, such interventions can be considered as a precursor of a subsequent permanent intervention under specific conditions if publicly accepted.

In any case, the COVID-19 pandemic raises the issue of public participation in designing urban spaces, a fact that converges in SUMPs' philosophy and practice. Resilient planning strategies should be incorporated even at this type of planning interventions, as it is not only necessary for facing environmental and socio-economic crises but also support democracy and participatory user-centric planning. In the case of street design, community engagement is not widespread in Greece as much as in other countries. According to a recent study about Athens (Kyrivakis, 2021), Athenians have never participated in planning and design processes. There are some exceptions: (a) cases of self-organised interventions took place in degraded neighbourhoods of Athens -it is about small roads in the Metaxourgeio neighborhood- (Bakogiannis et al., 2015), and (b) organised interventions in road sections carried out through integrated programmes, like the one implemented in the Commercial Triangle of Athens, where many narrow streets with commercial activity have already been transformed into pedestrian streets. The latter was a pilot implementation of a redevelopment project that has plenty of similarities with the interventions implemented during the pandemic.

The Mayor of Athens at the midst of the pandemic crisis introduced the pilot project, called “The Great Walk of Athens” (GWA), with the promise that this may become permanent if positively assessed by the Athenians. This would be achieved by replacing the initial emergency works with new improved infrastructure. According to local authorities, the Municipality of Athens seems to draw from the collaborative governance literature to understand the dynamics of community collaboration in crisis responses. In this paper, an evaluation is made through an electronic survey. Conclusions concerning the project as well as the public perception concerning community engagement are derived.

3. Research design

3.1. The case study area

The Municipality of Athens has been selected as our case study area, because of the extensive pandemic-induced road network interventions that occurred in its very heart. Its permanent population is estimated to be 664,046 people (Hellenic Statistical Authority, 2011); however, the overall Athens Metropolitan Area (AMA) population, i.e., people that may well access Athens daily for work or social reasons, is closer to 3.7 million (Hellenic Statistical Authority, 2011). By using the guidelines of the Transportation Engineers Association (Charalampakis, 2020; Ses, 2020) and the recommendations of medical experts (see in Tsiodras, 2020; Giameilou, 2020), local authorities proceeded with immediate interventions whose goal was to provide more space for pedestrians and cyclists to move within the city centre. Crucial to that was a COVID-19 emergency Ministerial Decision (MD YIEN/ΔΜΕΑΛΠ/57298/225) which allowed the fast-track development of works.

This political option could not have been implemented in case no previous planning was available. Concerning this case study area, a similar proposal has been made in 1980s, when the Minister of Planning and Environment, Mr. Tritsis, proposed to pedestrianize one of the most important streets of the city centre (Tritsas, 2013): Panepistimiou Street. This is the backbone of the GWA project. Such a proposal was based on the initial function this street played; that of a walking boulevard. Although disapproved, the proposal was integrated in the previous pilot project, called Rethink Athens action. Once again Panepistimiou Street was envisioned as a place where people walk, cycle and enjoy more actively the urban landscape. Mass transit was also a focal point that could have been enhanced via a proposed tramway extension.

Another similarly-minded renewal plan took place, during 1996–2004. It became known as the “The Great Walk” and its goal was to consolidate the various archaeological sites located in the city centre. A large part of the plan was completed. However, there were incomplete parts that were integrated in the recent interventions made in order to decrease the virus spread. Queen Olga Street (it is the part between the
Columns (or Temple) of Olympian Zeus and the Panathinaic Stadium) consists of such a typical example, as its previous redevelopment was eliminated in the development of the tramway that terminates in Syntagma Square. This new pilot, that is examined by our study, was promoted under a similar name, i.e., GWA (Fig. 1), referring to the idea of a single pedestrian zone in the city centre that connects the central landmarks. The GWA was quite extensive in relation to the original inspiration, as it included significant renovations, with a characteristic one in the western part of Syntagma Square. The GWA pilot embraced also the

Fig. 1. The interventions that took place in Athens in the context of the GWA trial.
interventions in the commercial triangle of Athens (see in sub-Section 2.3) to send a message that this is an extensive and strategic intervention that will change the image of the city within the next few years.

As Fig. 2 highlights, the GWA trial has been approved by the City Council on May 2020, as part of a series of emergency measures to deal with the pandemic. Construction works have been completed during a three-week period from early June 2020 to the end of the same month. In late July 2020, changes have been implemented in a part of the GWA, since citizens have been protesting about the project’s ‘traffic management’ effectiveness. For more than a year, the GWA trial remained active. Athenians’ opinion about the works has been expressed mainly through social media or the press. During August 2021, the Mayor of Athens announced that the project will become permanent, with some minor changes in its initial design, in order for the transport redevelopment plan to face people's needs. However, during 2021, the project has been approved by the Central Council of Urban Planning Issues and Disputes and the Central Council of Architecture.

According to the timeline announced, construction works may be completed within a sixteen (to twenty) month period. Indeed, renovation works in Syntagma Square are nearing completion (Fig. 3), while works in Panepistimiou Street need more time to be completed. It should be noted that the implementation of these works is not contrary to the decision issued by the Council of State about the cancelation of the Common Ministerial Decision for the GWA (Δ1α/ΓΠοικ.31688/21.5.2020), as it does not concern neither the content of the project nor its function.

3.2. Research methodology

The implementation of sustainable mobility intervention packages, meaning to respond to COVID-19, raised questions concerning their democratic character, as community engagement and consultation were limited but this was inevitable to a degree because of their urgent nature and the uncharacteristic need to be fast-tracked. At the same time their impact has also not been evaluated thoroughly through a user-centric lens; there is a scarcity of public acceptability studies testing the ‘success’ and ‘appropriateness’ of these interventions. The focus of this paper is to study the acceptance and functionality of the Great Walk of Athens project according to its users; this could perhaps allow us, to some degree, to understand the success of similar roadwork programmes that have been carried out not only in Greece but also in other countries. Our work also assesses the ‘before’ and ‘after’ the GWA intervention participant preferences so that we can assess how ‘successful’ these changes were.

An e-survey (Fig. 4) was the backbone of our research; a methodological choice allowing the delivery of more easily generalisable findings that could be applicable to a broader context. There are many papers, in the field of urban transport, in which a questionnaire survey has been used to understand the motives and behaviour of people (e.g., Cohen et al., 2015; Nikitas, 2018; Renaud et al., 2017; Zhao & Li, 2017). The reasons why we chose an e-survey relate to: (a) the short time needed for data collection, (b) the fact that some questions are more possible to be truly answered under the safety of anonymity (Bader et al., 2016), and (c) the physical restrictions imposed because of the pandemic that certainly prioritise remote and online data collection procedures.

The questionnaire used in this study was a structured one, contained 49 questions and was written in Greek. It was organised in six sections of closed-ended questions (Table 1), the great majority (32) of which used a Likert scales design (Table 1), as it is useful for understanding the level of agreement or disagreement when a researcher is interested in investigating people’s perceptions, attitudes and values (Shende & Upagade, 2013). Moreover, by using Likert scales it is easy to convert responses into a quantitative ordinal format through the usage of software. The rest of the questions (Table 1) had a multiple-choice structure (three questions with only two choices (yes/no question and 13 questions with more choices). The time needed to fill in the questionnaire was estimated to be approximately 7–10 min. The complete survey is provided in the Annex.

A total of 401 online answers were collected; this was enabled by a systematic social media and e-mail list enhanced recruitment scheme. Such a number is an ideal one as the sample size was estimated in the range of 385 answers. The sample was determined by using the Fisher's
(1998) formula given as:

\[ n = \left( \frac{z^2 \cdot p \cdot q}{d^2} \right) \]

where: \( n \) = sample size for large population. For this study, as population size is considered the total population of the Athens Metropolitan Area (AMA), instead of the Municipality's population. The reason why we decided to make this consideration is due to the fact that the Municipality of Athens is the hub where the great majority of the AMA population work and meet each other, on a daily basis. \( z \) = constant value depending on the confidence level, where for this study it is set at
95%; thus, z-score is set at 1.96. \( p = \text{proportion of units in the sample size possessing the variables under study (standard deviation), where for this study it is set at 50\% (or 0.5), } q = \text{percentage of failure (set at 1-p), } d = \text{precision level desired or the significance level (margin of error), where for this study it is set at 5\% (or 0.05).}

Concerning the profile of the 401 research participants, Table 2 reports their demographic characteristics on gender, age distribution, residence, employment and income. The gender proportion is balanced and is in line with general population Census statistics. Most of our respondents live in the central part of the AMA. Relatively good correlation between the sample and Census statistics is also found in the age distribution, mainly in the ages between 30 and 70 years. The increased participation of young people is attributed to the electronic data collection and our recruitment scheme using social media; this is a very common characteristic in surveys dealing with innovation and intervention in transport (Nikitas, Vitel, and Cotet, 2021).

In terms of our data analysis, answers were statistically analysed using SPSS v.25. The statistical approach starts with descriptive statistics. Markov Chain Model (MCM) analysis was applied, and more specifically a discrete-time Markov chain, in order to estimate the future state of transportation volume per transportation category. The model can generate, through stochastic processes, the future states of a probabilistic system based only on the previous state. This certain characteristic is referred to as a Markov property, which is used to describe the lack of memory in stochastic modelling. This is generally performed using SPSS v.25. The statistical approach starts with descriptive statistics and our recruitment scheme using social media; this is a very common characteristic in surveys dealing with innovation and intervention in transport (Nikitas, Vitel, and Cotet, 2021).

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Finally, in order to understand how people feel about the GWA project, an Ordinal Regression Analysis (ORA) was used. ORA was employed since it is an appropriate generic model for the empirical on the assumption that the GWA was developed in June 2020 and the survey has been completed in June 2021. The MCM will make predictions for the next 29 years (2021 to 2050). We choose to make estimations until 2050, as it is the landmark year to “build a truly global coalition for carbon neutrality”, according to the UN Secretary-General A. Guterres (UN, 2020).

Table 3
TPM for car use estimation.

| Before | Daily | Few times/week | Once a week | Once a month | Rarely | Never |
|--------|-------|----------------|------------|-------------|--------|-------|
| After  | 0.794 | 0.088          | 0.000      | 0.059       | 0.059  | 0.000 |
|        | 0.043 | 0.754          | 0.116      | 0.029       | 0.043  | 0.014 |
|        | 0.000 | 0.189          | 0.432      | 0.162       | 0.189  | 0.027 |
|        | 0.026 | 0.026          | 0.053      | 0.474       | 0.368  | 0.053 |
| Rarely | 0.023 | 0.023          | 0.057      | 0.023       | 0.557  | 0.318 |
| Never  | 0.000 | 0.009          | 0.009      | 0.000       | 0.072  | 0.910 |

Table 4
ISM for car use estimation.

| Daily | Few times/week | Once a week | Once a month | Rarely | Never |
|-------|----------------|-------------|--------------|--------|-------|
|       | 0.088 | 0.174       | 0.085        | 0.080  | 0.220 | 0.353 |

Table 5
Summary statistics of key independent variables.

| Variable name | Variable type | Min | Max |
|---------------|---------------|-----|-----|
| Gender        | Binary        | 0   | 1   |
| Age           | Ordinal       | 1   | 7   |
| Neighborhood  | Categorical   | 1   | 6   |
| Income        | Ordinal       | 1   | 5   |
| Car ownership | Binary        | 0   | 1   |
| Motorcycle ownership | Binary | 0 | 1 |
| Moving frequency to the city center | Ordinal | 1 | 6 |
| Satisfaction with regard to public transport (PT satisfaction) | Ordinal | 1 | 5 |

Table 2
Profile of the participants in the survey vs profile of permanent living population.

| Gender (%) | Age (%) | Residence (%) | Occupation |
|-----------|---------|---------------|------------|
|           |         | Central sector | Sample     |
|           |         | Pireaus and South sector | Sample |
|           |         | North sector | Rest of Attica |
|           |         | West sector | Training |
|           |         | East sector | Engineering |

| Gender (%) | Age (%) | Occupation |
|-----------|---------|------------|
| Men       | 18-29   | Finance    |
| Women     | 30-39   | Law        |
|           | 40-49   | Medicine   |
|           | 50-59   | Humanities |
|           | 60-69   | Students   |
|           | 70-79   | Rest       |
|           | 80+     | categories |

| Income (euros) | Sample |
|---------------|--------|
| <600          | 601–1000 |
| 1001–1500     | >1500–2000 |
| >2000         | Not referred |

| Sample | Population* |
|--------|-------------|
| 14.4   | 18.7        |
| 23.6   | 23.6        |
| 17.2   | 17.2        |
| 16.0   | 16.0        |
| 14.1   | 14.1        |
| 8.4    | 8.4         |
| 10.4   | 10.4        |
| 3.7    | 3.7         |

* Statistics are estimated based on a research hypothesis according to 2020 household income data for Greece Small Business Institute - General Confederation of Professional Craftsmen of Greece (IME-GSEVEE, 2021). This dataset is used due to the fact that recent data are not available for the AMA per se.
analysis of any ordered, categorical dependent variable, which in this case represented the attitude towards the implementation of the intervention. Our dependent variable in the study, people's evaluation of the project, was captured by a series of questions in the survey asking each respondent to rate, on a 1–5 Likert scale, the degree to which they agree or disagree to that. A score of 1 representing least agreement, and 5 representing maximum agreement. The independent variables are presented on Table 5. This twin survey analysis approach (i.e., the combination of MCM and ORA) adds validity and originality merits to our work.

4. Results

4.1. Descriptive statistics

In this section, data related to the travel mode choices of our sample including vehicle ownership status are analysed. We found that 70.5% of our respondents are car owners, 19.5% are motorcycle owners and 40.6% are bicycle owners. Their modal choice is mainly a result of the desire to move comfortably (41.4%), which is associated with high rates of car ownership. However, the need to reduce travel time (19.9%), mainly for motorcycle owners, and the absence of good public transport (19.6%) also had a significant effect. Bicycle owners seemed to consider intervention package and which measures made more sense for Athe
cost reduction (11%). Many of our questions referred to pre-GWA and bike lanes, active travel uptake did not flourish; changes in the mobility. Even though a significant part of the interventions focused on the widening of sidewalks and the creation of pedestrian zones through Greece, during the conduction of the survey and (b) the limited percentage of motorcycle owners (Table 5).

• The usage of motorcycle (both for drivers and passengers), in the period after the implementation of the GWA project, shows a declining trend (Table 6). This finding is likely to be a result of: (a) the existence of movement restrictions, due to the spread of the virus, throughout Greece, during the conduction of the survey and (b) the limited percentage of motorcycle owners (Table 5).

• The use of public transport shows a declining trend as well (Table 6). This observation is probably the result of the insecurity, concern and fear related to public transportation usage in pandemic conditions. This explanation justifies the behaviour of citizens who, under normal circumstances, would possibly consider using Athens’ multi-layer public transport system including metro, train, and bus services.

• The enablement of cyclists to travel to the city’s centre did not pay off much; there was a marginal positive change in uptake after the GWA initiative (Table 6). Similar results are recorded for pedestrian mobility. Even though a significant part of the interventions focused on the widening of sidewalks and the creation of pedestrian zones and bike lanes, active travel uptake did not flourish; changes in the cycling and walking usage rates post-implementation were almost insignificant as shown in Table 6. Possible interpretations of this result could refer to: (a) the existence of restrictions on movement (at times, there was a one kilometre restriction for each citizen in a certain radius around his/her home), (b) the absence of an integrated pedestrian and bicycle network that connects the neighbourhoods with the centre and (c) the tendency to devalue the project, due to the increased motor traffic congestion that was generated immediately after GWA’s introduction. The project’s devaluation happened in two levels; firstly, at a communication level by the media scruti

| Table 6 | Preferences (%) of the Athenians concerning traveling (by various means of transport) within the centre of the Athens, before and after the construction of the GWA. |
|----------------------|-------------------------------------------------|------------------|----------------|-----------------|----------------|----------------|
| Use of (means of transport) | Reference period | Frequency of use (%) | Daily | Few times/week | Once a week | Once a month | Rarely | Never |
|----------------------|-------------------------------------------------|------------------|----------------|-----------------|----------------|----------------|
| Car                  | Driver A: before the implementation of the GWA – B: after the implementation of the GWA | 9.1              | 18.7           | 9.8            | 10.1           | 22.8           | 29.5           |
|                      | Fellow passenger | 8.6              | 18.0           | 8.6            | 7.8            | 21.9           | 35.2           |
|                      |                  | −0.5             | −0.7           | −1.2           | −2.3           | −0.9           | +5.7           |
|                      |                  | +1.1             | −0.1           | −3.0           | −2.4           | −3.0           | +7.3           |
|                      | Motorbike Driver | 3.7              | 10.2           | 2.9            | 3.1            | 5.0            | 75.1           |
|                      | Fellow passenger | 2.9              | 10.8           | 1.9            | 2.1            | 5.3            | 77.0           |
|                      |                  | −0.8             | +0.6           | −1.0           | −1.0           | +0.3           | +1.9           |
|                      |                  | +0.6             | +0.3           | +3.2           | +3.2           | +10.3          | +73.3          |
|                      | Public transport | 19.3             | 32.6           | 15.4           | 11.5           | 15.9           | 5.5            |
|                      |                  | 12.0             | 29.2           | 14.8           | 13.0           | 18.0           | 13.0           |
|                      |                  | −7.3             | −3.4           | −0.6           | +1.5           | +2.1           | +7.5           |
|                      | Bicycle          | 1.3              | 10.9           | 3.4            | 4.7            | 6.0            | 73.8           |
|                      |                  | 1.3              | 11.7           | 4.9            | 3.4            | 7.0            | 71.6           |
|                      |                  | +0.0             | +0.8           | +1.5           | −1.3           | +1.0           | −2.2           |
|                      | Pedestrian movement | 9.8             | 28.2           | 15.0           | 14.0           | 21.7           | 11.4           |
|                      |                  | 9.2              | 29.6           | 12.6           | 14.7           | 23.3           | 10.7           |
|                      |                  | −0.6             | +1.4           | −2.4           | +0.7           | +1.6           | −0.7           |

a: B: before the implementation of the GWA – A: after the implementation of the GWA – V: variation (A–B).
b: The highest and lowest prices are in bold. Variation (A–B) is presented in italics.
the GWA’s implementation. It is characteristic that, in a relevant question regarding the evaluation of the sidewalks in the centre of Athens, the attitude of our respondents differed only slightly, since after the construction of the GWA project a positive attitude was expressed by 22.1% of them against 21.7% for the pre-GWA era.

4.2. Markov chain model analysis

The travel preferences that participants self-reported, taking into account their experience in using the GWA for almost a year, are similar enough to the estimations made through the MCM for the next three decades (Fig. 5), in case no changes in the GWA will be made. As Fig. 4 depicts, there is an ongoing trend to decrease frequent car use (both at the levels of driver and passenger). A similar prediction is also made for motorcycle use. In case of bicycle use, the predictions are slightly different comparing to the descriptive statistics. A great majority of people that did not use a bike before the pandemic will probably change behaviour. According to the MCM, even more people are expected to cycle in the city centre of Athens, few times a week (until 2035). Concerning pedestrian movements, the predictions depict an increasing trend in people who travel on foot either rarely or few times a week. Daily pedestrian movements will be decreased in the streets, to whom the survey is referred, by 2028. This trend does not depict an expected behaviour. However, it is probably related to the absence of an existing walking network within the city centre. The fact that participants were affected by the restrictions related to the walking distances—such restrictions were active when the survey started—may also be in line with this estimation. The latter has also affected estimations made about the use of public transport; according to the prediction, Athenians will reduce public transport use in the city centre, within the next few years.

4.3. Ordinal regression analysis

Findings derived by the MCM analysis are related to the ones derived by the ORA (Table 7). Taking into account that bicycle use and ownership will be increased in the near future, we have expected that bicycle owners agree to the implementation of the GWA project. On the other hand, car use is expected to be decreased; as a result, car owners are expected to disagree to these works. However, ORA proved a strong positive relation between bicycle and motorcycle ownership and agreement with the GWA project. Our guess for the latter, seemingly paradoxical result, is that motorcyclists may consider that long-term they will benefit too from reduced car traffic congestion; meaning that at some point will have quicker and healthier (i.e., less air pollution exposure) rides. No relationship was recorded between car ownership and the attitude towards this project.

Focusing on the GWA evaluation, people who agree with such a project are those who move to the city centre just a few times a week. People who were dissatisfied by the way public transport functions, disagree to this project, as traffic jams increased and no improvements have been made in public transport. Generally speaking, male and lower income participants were much more likely that women and wealthier Athenians respectively to approve the GWA project.

4.4. Specific GWA measure acceptance results

Apart from this general evaluation, our survey has also focused on the sub-sections (or rather specific interventions) of the GWA package. Athenians were more satisfied by the interventions that took place on Ermou Street. They were also satisfied by the redevelopment of the western part of Syntagma Square (Table 9). Concerning Ermou Street, the attitude of the participants is perhaps dominated by the small scale of the intervention that is associated to the construction of a bicycle path in a road section that operates as a continuation of a pedestrian commercial street. In the case of the Syntagma Square, the intervention focuses on the development of a zone where pedestrians can easily walk, rest and socialise. This place was developed in the position of an illegal taxi pick up station; that was the reason why no serious objections against the intervention were recorded.

Particularly negative criticism was received for the renovation of Panepistimiou Street. A significant 54.7% of respondents fully or partially disagree with the intervention stating that: (a) no traffic management study has been performed and (b) the development of additional pedestrian traffic is not required along this road axis where there are already large sidewalks. In fact, 44.6% of the participants consider positively the municipal decision to rapidly modify the initial plans, when increased opposition reactions were recorded.

A large portion of the participants (47.9%) believe that the GWA plan has to be totally withdrawn, based on their dissatisfaction about the redevelopment plan for Panepistimiou Street. This finding is also related to people’s opinion about extending the GWA project by promoting similar design interventions in other streets in the city centre. Around, 34.5% of the respondents disagree to this perspective and 21.1% do not declare any positive or negative opinion. This attitude is possibly related to the mode ownership status of the respondents. Cyclists tended to support the project.

The findings should be taken into consideration during the implementation of the SUMP for the Municipality of Athens. As it is already mentioned, sustainable urban mobility planning is an approach for empowering community voice in the decision-making that affects the urban environment in which they live. Thus, such a negative predisposition derived by the recent GWA project may raise dispute concerning decision-making process and refusal to participate in future community engagement activities. Our survey underlines locals’ perception of the absence of participation procedures during the GWA development. Actually, 74.2% of the respondents support that it was a hasty political decision which is not supported by people’s needs. Moreover, 54.3% of the participants do not believe that this project contributed to eliminating viral diffusion, speculating that the pandemic acted as a catalyst in carrying out this project, whose goal was not the pandemic management. The above view is in line with views expressed in the media, which highlight the absence of community engagement. However, there is a positive finding (support by 42.8% of the respondents) concerning the rearrangement of the interventions after a general reaction of the public, which allows the citizens to feel like participants in the formulation of urban policy regarding their city centre.

5. Discussion

Our study identifies and subsequently analyses some key topics concerning a city centre redevelopment project that took place in Athens, Greece, during the pandemic outbreak (2020–2021). The Great Walk of Athens (GWA) was constructed as an emergency anti-COVID mobility intervention to limit the viral diffusion. Its aim was to promote walking and cycling as the best physical spacing-friendly modes (Campisi et al., 2020; Nikitas, Tsigidinos, et al., 2021) over motor traffic in general and car usage in particular.

The results of our e-survey, highlight the critical importance that our participants, when it comes to their approval of the scheme, assigned to: (a) the objectives and rationale of the intervention package, (b) the magnitude of the changes and how severe are their impact on the previous status quo, (c) design and timetable specifics of the implementation and (d) the public participation needed for delivering the best possible project. These are lessons in line with what the literature on best sustainable urban mobility planning is an approach for empowering community voice in the decision-making that affects the urban environment in which they live. Thus, such a negative predisposition derived by the recent GWA project may raise dispute concerning decision-making process and refusal to participate in future community engagement activities. Our survey underlines locals’ perception of the absence of participation procedures during the GWA development. Actually, 74.2% of the respondents support that it was a hasty political decision which is not supported by people’s needs. Moreover, 54.3% of the participants do not believe that this project contributed to eliminating viral diffusion, speculating that the pandemic acted as a catalyst in carrying out this project, whose goal was not the pandemic management. The above view is in line with views expressed in the media, which highlight the absence of community engagement. However, there is a positive finding (support by 42.8% of the respondents) concerning the rearrangement of the interventions after a general reaction of the public, which allows the citizens to feel like participants in the formulation of urban policy regarding their city centre.

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Fig. 5. Estimations through a MCM analysis, concerning car use (a–b), motorcycle use (c–d), PT (e), bicycle (f) and pedestrian movements (g).
residents of Athens were wary of the GWA project. Athenians, at large, were not satisfied from the deliverables, practicality and fit of the GWA intervention mainly because this road space re-allocation project was promoted as a way to make transport and built environment use more responsive to the pandemic challenges. More specifically, 54.3% of the respondents expressed their dissatisfaction as: (a) a great amount of money were spent for an urban mobility design project, in a period that problems were identified in the under-resourced Greek health service sector, (b) Covid-19 cases remained in very high levels across the Athens Metropolitan Area despite the construction of the GWA and (c) problems related to extensive traffic jams and limited utilisation of the remodelled spaces were observed and quickly became viral in social media platforms and received negative attention by the mainstream media. It should be underlined that most of the supporters of this project are those who own and use a bicycle or a motorcycle. Car ownership according to our results did not seem to affect people’s attitude in a direct way.

If we go deeper into the GWA intervention package evaluation and look separately at some of its elements (i.e., particular roads that changed) we see that public attitudes may differ from a specific intervention to another. The redevelopment of Panepistimiou Str., for example, was the one that raised many disagreements (54.7%). Such a disagreement is probably the reason why people are also hesitant towards the rest of the GWA project. We believe that this negativity is developed because people tend to identify streets as “canals of movement” - as it was much more obvious in previous decades (Siolas et al., 2015) instead of social spaces (Pandit et al., 2020; Vernez-Moudon, 1991). Bertolini’s (2020) point of view can be used in order to justify local community; he argues that even decision-makers have not a clear vision about their goal when a street renewal project is going to be developed. According to a recent study concerning public spaces in Athens, Greece (Kyriakidis, 2021), this observation is maybe related to the fact that roads are usually identified as places where mandatory activities usually take place; on the other hand, social activities are affiliated with public parks and squares. Thus, even though there is a planning background supporting Panepistimiou Str. renewal, people cannot visualise its potential to be used as an open public space. This work proves that bigger and more radical road modifications get more public resistance.

Making the GWA project permanent, at least in its 2020–2021 form, is a plan Athenians might be hesitant to accept. They have not received a clear message of how this road space re-allocation plan can change positively the image of Athens. A significant 34.5% of the participants have a clearly non-approving attitude concerning a potential expansion of this programme; 21.1% of them have a neutral stance as they have not been convinced of its effectiveness. In the past, Athenians tended to support such interventions, as a part of making the city greener and more sustainable. Cyclists, pedestrians and motorcyclists are the ones who mainly support this idea. Outterside (1995) presents similar connotations in his book, with examples that usually happen abroad where local community drives the choice of a particular development project (Castillo-Manzano et al., 2014). Secondly, participants’ income and occupation does not

Table 7

| Parameter estimates | Estimate | Std. Error | Wald | df | Sig. |
|---------------------|----------|------------|------|----|------|
| Agreement to the development of the GWA project | 0.387 | 0.189 | 1.453 | 1 | 0.228 |
| Agreement to the development of the GWA project - 1 | 1.092 | 0.379 | 3.061 | 1 | 0.081 |
| Agreement to the development of the GWA project - 2 | 0.784 | 0.510 | 2.357 | 1 | 0.125 |
| Agreement to the development of the GWA project - 3 | 2.022 | 0.523 | 17.757 | 1 | 0.000 |
| Agreement to the development of the GWA project - 4 | 0.975 | 0.375 | 2.701 | 1 | 0.099 |
| Agreement to the development of the GWA project - 5 | 0.503 | 0.244 | 4.624 | 1 | 0.033 |

Table 8

| Parts of the GWA | 1-5 Likert-scale graduation |
|------------------|-------------------------------|
|                  | 1  | 2  | 3  | 4  | 5  |
| Q. Olga Str.     | 22.9 | 18.6 | 19.3 | 20.1 | 19.1 |
| Panepistimiou Str.| 41.2 | 13.5 | 16.8 | 15.3 | 13.2 |
| Syntagma Sq.     | 21.5 | 13.0 | 21.3 | 21.5 | 21.0 |
| Ermou Str.       | 21.1 | 15.2 | 25.8 | 22.9 | 14.9 |

N = 387, Model chi-square = 127.435; p > 0.05, deviance = 1.000, -2log likelihood = 995.335, Nagelkerke Pseudo R² = 0.293, Test of parallel lines: 0.335.

* This parameter is set to zero because it is the base category (the reference for comparisons).
play a huge role in their stance, although local business acceptance scales have increased post-implementation in other similar redevelopment projects (Ozdemir & Selçuk, 2017; Panagopoulos et al., 2018; Soni & Soni, 2016).

Another finding of this survey was the usage of alternative transportation options instead of cars. That is the reason why, according to AbouKorin et al. (2021), investment in pedestrian and cycling infrastructure is necessary to meet mobility demands of citizens during a health crisis. We found that people avoided to use means of public transport; similar observations have also been made in other metropolitan areas, like New York city (Harris, 2020; Wang et al., 2021). This observation is related to the fear of viral diffusion in closed spaces, as not many changes have been applied in the metro/tram/bus-lines timetable and crowding was difficult to be avoided. However, there is an expectation that this will be changed, in the near future, as usually happens when: (a) a new plan is applied or (b) the level of risk perception regarding Covid will decrease, as was observed in Seoul, South Korea (Park, 2020), especially when the pandemic will be close to its end.

Furthermore, an important finding, severely understudied by previous Covid-centric transport literature, is related to citizen participation. Kalantidis (2020) claims that the main problem in the implementation of the GWA was the absence of substantial public participation during the planning and development process. Our findings about resistance and disapproval actually support this claim with appropriate user-related evidence. This view is also in line with the one of Zagorianakos (2004) discussing similar important transportation works and their environmental assessment that took place in Athens, before the Olympics of 2004 (fast-track investments enabled by the Regulatory Plan of Athens (RPA) with limited consultation). The form of “collaborative planning” that took place when the GWA was constructed was negligible and seems to be an issue of importance that can help us draw useful conclusions about the need of public engagement and interaction in transport decision-making.

The interventions were considered as “street experiments” (Anon, 2020); these are projects where the dominance of motorised mobility is challenged over the “stationary” use of public space and the non-motorised mobility (Bertolini, 2020). During a street experiment, much like we did in the case of the GWA context, researchers, planners and decision-makers ought to collect data for system-wide impacts in order to make comparative evaluations of each intervention. Mass media and social media can be the channels that propagate this reliable information to the public to make them aware about the ‘big picture’. However, in order to fully claim that a participatory planning process takes place, more engagement and co-creation should be achieved. Volume recordings, observations, surveys and participatory sessions utilising new technological avenues like mobile apps could support planning procedures to be more engaging and user-centric. Concerning the GWA project, no official invitation for participatory sessions have yet to be published. This is possibly the very first study reporting general public attitudes and experiences from the project.

Finally, we should underline that a health crisis like the Covid-19 outbreak may affect people’s perceptions about urban travel as well as their travel behaviour. This crisis, in combination with projects like the GWA, may support the abandonment of a century-long car-centric travel eco-system in favour of a more sustainable system that is based on active (and public) transport. Our analysis (via the use of MCM) gave specific predictions on how cycling and walking may be increased unlike car traveling that is expected, especially now with the low carbon future design emphasis at its very peak after COP26 in Glasgow, to be decreased.

6. Conclusions

This study is discussing a road redevelopment programme that came to reality in response to the COVID-19 outbreak. Although, it is focused on Athens, many similar examples have been identified in various cities, worldwide (see Nikitas, Tsigidinos, et al., 2021). In all cases, local authorities decided to provide more public space to the people in order to move in a safer way (i.e., walking, cycling, using means of micro-mobility). Such plans have been seen as a tool of recovery that fit well the development of compact cities and 15-min cities which is one of the directions of the Agenda 2030 to make local societies and the planet, as a whole, more sustainable.

Our work, despite some minor weaknesses that we acknowledge (e.g., although appropriate we could have had a bigger sample/survey completion biases existed like self-reporting and social desirability biases) is able to underline some important lessons that could potentially inform similar intervention efforts. We believe therefore that this study may be useful not only to researchers but also to practitioners (planners, designers, mobility providers) and policy-makers, as it may be an evidence-based guide to support their decision-making.

We found that citizens may be dissatisfied when rapid large-scale projects are materialised with no or limited public consultation. The lack of engagement in the planning process, more often than not, generates disapproval reactions. It is also necessary to give time to people in order to get familiar with such interventions. On the other hand, quick interactions derived by participation procedures (e.g., participation by using electronic and mobile-phone apps) encourage citizens to reflect and comment on their local environment and feel empowered.

Fast-track design practices seem to have created problems in Athens. People did not feel that the outcome was the expected one, as the delivery and aesthetics of the streets were not ‘good enough’. Although in other cities, such a way of planning was acceptable and citizens like the fact that roadworks were completed in a quick and cheap way, Athenians expressed their dissatisfaction, maybe because the cost of the GWA package was considered high for an intervention that ended up adding travel delay to those driving a car.

Another reason why people expressed their negative opinion about the project is related to the absence of an integrated and strategic planning procedure that will combine urban and traffic policies. Although Greek cities aim to this goal (Eleftheriou et al., 2020), the spatial planning system did not allow it; thus the need for re-organising it. Indeed, in the GWA case, no measures were taken in order for the car traffic to be regulated within or diverted from the city centre. Such measures may be related to the development of traffic ring(s) and the limitation of cars entering the Athens ring zone, by reducing the number of circular lanes in streets directed to the city centre (i.e., Syngros Avenue) or considering road pricing-based measures. Moreover, urban design plans should be accompanied by corresponding interventions in terms of urban transportation policy. Changes in public transport timetable and route design can support the function of the redevelopment areas. Public transport, despite its possibly temporary Covid-inflected ridership decline troubles, should be the cornerstone of a city transport system and even active travel prioritisation plans should include interventions about public transport improvements.

Residents of the city centre seem not to be quite interested in their neighborhood. It seems that they are not as connected to it as expected, according to Place Theory, as no relation between residence location and attitude towards the GWA has been observed, in our regression analysis. This may be related to the importance of city centres as points of interest that support, due to their land use patterns, a great concentration of people for work, entertainment and shopping activities. Hence, increased congestion phenomena, that are directly or indirectly associated to an intervention project, make the interaction with the city centre a truly unpleasant experience for residents. Another explanation may be related to the roadwork problems created during the construction period and the early functioning period. In that case, locals’ attitude may be related to the “Not in my Backyard” (NIMBY) phenomenon (Piat, 2000).

The reason why such designs are made should be clarified to the local community transparently and with engaging justifications. In case, more than one goals have been set, all of them should be notified. In that way,
communities do not have false expectations. By informing the people, it is also possible to urge them to participate in a planning process in a more active way, like crowd-sourcing. When it comes to our work, more emphasis should have been given by the people responsible for its introduction to GWA’s possible role as an intervention drastically improving sustainable mobility options by sacrificing motorised travel space. A more pronounced and publicised dual role (i.e., anti-Covid and pro-environmental) could have made GWA more acceptable. Also, a cost-benefit analysis could have been a robust tool to support and improve decision-making.

Most of the above points are in line with Moughtin’s (2003, p. 88) view, according to whom “there is some danger in attempting to transfer design concepts which may be effective at one particular time, or at one place or in one culture to a quite different setting”. Local culture, weather conditions, people’s habits and perceptions affect communities’ attitude and, thus, differences were observed between the case study of Athens and other cases mentioned in the literature. Even aesthetics and functionality in the built environment play an important role in people’s perception about a redevelopment intervention.

Future research should focus on the identification of those factors that are essential for building up public acceptance in relation to redevelopment interventions such as the GWA. These factors should be contextualised, prioritised and interrelated with each other through qualitative and participatory cross impact prospective methods so that they could be integrated as an accurate reference point for the perceptions of the people within the urban planning process. This will allow genuine people-centric transport and urban design plans to be applied.

CRediT authorship contribution statement

Charalampos Kyriakidis: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. Ioannis Chatziioannou: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. Filippos Badias: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. Alexandros Nikitas: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. Efthimios Bakogiannis: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing.

Declaration of competing interest
None.

Data availability
Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cities.2022.103966.

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