

PROPENSITY AND PROCLIVITY OF VULNERABLE ROAD USERS TOWARDS PERSONALISED ROAD SAFETY SOLUTIONS

COLIN A. BOOTH¹, GARGY M. SUDHAKARAN¹, SAMUEL J. ABBEY¹, ABHINESH PRABHAKARAN¹, PANAGIOTIS GEORGAKIS², SURESH RENUKAPPA², SUBASHINI SURESH², ADEL ALMOHAMMAD², BABIS MAGOUTAS³, AMALIA BOZINAKI³, FILIPPOS GKOUNTOUMAS³, MARINA GEORGIOU⁴, DORINE KARVOUNIARI-MATZAKOU⁴, ANTONIO D. MASEGOSA⁵, ANDER ARRIANDIAGA⁵, OLIVA G. CANTÚ ROS⁶, JERÓNIMO BUENO-GONZÁLEZ⁶, MARIA POHLE⁷, NORA STRAUZENBERG⁷, VANESSA S. HILSE⁷, CRISPIAN POON⁸, NIMALAN CHANDRANESAN⁹, RUTH ANDERSON⁹, KATIE PARNELL⁹, HARRIS SIAKANTARIS¹⁰, EIRINI KOSTAVARA¹⁰, ORESTIS DAVLIAS¹⁰, MICHAEL MARAGKAKIS¹⁰, JAYANT SANGWAN¹¹, MARUŠA BENKIC¹¹, RÉMY RUSSOTTO¹¹ & AGIS DIGKAS¹²

¹College of Arts, Technology and Environment, University of the West of England, UK

²Faculty of Science and Engineering, University of Wolverhampton, UK

³Frontier Innovations, Greece

⁴Netcompany-Intrasoft, Luxembourg

⁵Deusto Institute of Technology. University of Deusto, Spain

⁶Nommon Solutions and Technologies, Spain

⁷Fraunhofer IVI, Germany

⁸Onsee, UK

⁹Oxfordshire County Council, UK

¹⁰Cyclopolis, Greece

¹¹CORTE, Belgium

¹²Elta Courier, Greece

ABSTRACT

Vulnerable road users (VRUs) account for ~70% of Europe's total road fatalities. Whilst there has been an upsurge in solutions to improve infrastructure safety and vehicle safety, solutions for VRUs have not received the same attention. This study gathers the opinions and preferences of VRUs from across several European nations towards the design and implementation of possible road safety solutions. An online questionnaire survey (available in English, German, Greek and Spanish languages) was shared with potential participants. Based on the data collected for the first three months (30 September 2023 to 31 December 2023), the survey received responses ($n = 719$) from a wide variety of participant VRU types but chiefly those representing the pedestrian and cyclist groups. Findings reveal there is a strong interest in personalised technology-informed road safety products for VRUs, including safe/clean routing. It is suggested that designs should provide a preference towards fast routes but ideally away from routes used by fast moving vehicles, preferably along designated pedestrian, cycle or bridleways and/or through/near green infrastructure (e.g. public parks) or alongside waterways (e.g. rivers, canals). On-route streetlighting, on-route signposting and road/pavement surface type/condition are also important considerations. It is, therefore, proposed that the insights assembled from participants be judiciously considered when creating the features and functions of any road-safety solutions (e.g. mobile apps). Further, since this is part of a wider project using the precedent of co-creation, it is also proposed that any trials and testing should engage VRUs for evaluation and feedback to enhance the performance and potential market uptake of solutions.

Keywords: accident prevention, safe routing, mobile app, Living Labs, SOTERIA project.

1 INTRODUCTION

The European Commission has embraced an ambitious road safety target of achieving a 50% reduction (by 2030) in the number of fatalities and serious injuries on European roads. Moreover, this is only a milestone towards their 'Vision Zero' of reducing road deaths to almost zero by 2050 [1]. While collisions will continue to occur, death and serious injury are



considered largely preventable. Therefore, their main priority and intervention areas are focused on infrastructure, safe vehicles and safe road use. However, whilst Europe has the safest roads in the world (with just 2% of the ~1.35 million road fatalities worldwide), 70% of Europe's total fatalities in urban areas involved vulnerable road users (VRUs). These include both motorised VRUs (e.g. motorcycles, e-motorcycles, mopeds, e-mopeds, e-bicycles, e-scooters, hover-boards (Segway), mobility scooter riders) and non-motorised VRUs (e.g. bicycles, scooters, skateboards, horse/pony riders, wheelchair users, babies/toddlers in prams, joggers, pedestrians) (Fig. 1).

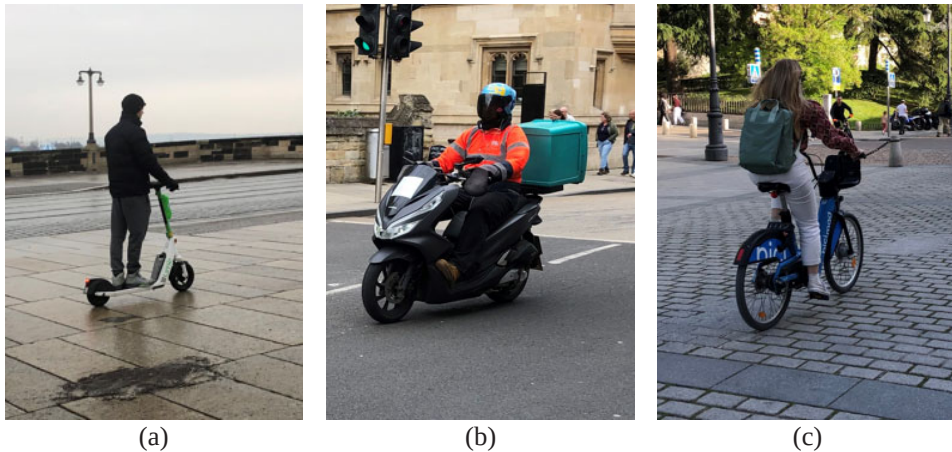


Figure 1: Examples of some European VRUs. (a) An e-scooter rider (Dresden, Germany); (b) Moped delivery driver (Oxford, UK); and (c) An e-cyclist (Madrid, Spain).

The safety of VRUs have been the focus of many national and international studies (e.g. motorcycles [2], mopeds [3], bicycles [4], e-bicycles [5], e-scooters [6], skateboards [7], mobility scooters [8], wheelchair users [9] and pedestrians [10]). Many articles propose solutions to improve the road safety of VRUs. Amongst many purported, Azimian and Jiao [11] suggest a critical initiative is to develop new infrastructure. Meuleners et al. [12] emphasise that improvements should be through infrastructure design. Buehler et al. [13] propose that constructing more cycle lanes or separate spaces for e-scooters could help move riders off pavements (sidewalks) – a desire that is expressed by both pedestrians and riders. Azimian and Jiao [11] also propose that educational campaigns are needed to raise awareness about road and personal safety. Dandona et al. [14] suggest the need to enact and enforce policy interventions towards mandatory PPE and effective traffic law enforcement.

Technology is increasingly recognised and adopted as a tool towards solving many societal issues. For instance, emerging technologies (beyond ITS) IoT, Block chain, Big Data, Artificial Intelligence and Digital Twins mean a wealth of smart techniques have been and continue to be developed for improved road safety. These include new and innovative in-built vehicle safety and sensor technologies [15] and smart on-road safety technologies [16]. By comparison, technologies created to improve the safety of VRUs have not received the same attention. Further, there seems to have been limited studies that have involved those stakeholders in the decision-making process. Therefore, the aim of this study is to gather the opinions and preferences of Europe-wide VRU stakeholders towards the design and implementation of possible road safety solutions.

2 BACKGROUND

Future urban mobility services require the convergence of various stakeholders to tackle social, economic, and ecological challenges within the context of mobility [17]. Kristensson et al. [18] highlight the importance of involving users as co-creators in the early stages of crafting solutions to generate more creative and customer-valued ideas. However, Zhang et al. [19] note that most users of technology-based services have limited technological knowledge, which can make it challenging for them to articulate ideas for innovative services that would create value. Technological progression, particularly in information and communication technologies (ICTs), plays a crucial role in facilitating co-creation interactions and interfaces. The advent of technologies such as artificial intelligence, machine learning, augmented reality, and virtual reality has further transformed conventional experiences into new, enriched participatory components, to steer project participants and alter behaviour patterns [20]. Frow et al. [21] stress the importance of expanding co-creation to include a wider range of stakeholders or ‘actors’, which can lead to the development of distinctive technology-based mobility solutions.

At the heart of co-creation lie the principles of opportunity and community, where end-users are actively involved in the design, testing, and implementation phases of technology solutions. This user-centric approach ensures that solutions are not only technically feasible but also resonate with the needs and preferences of urban residents and commuters [21]. By promoting transparency, accountability, and inclusivity, co-creation initiatives empower communities to take ownership of their mobility challenges and participate in shaping the future of urban transportation. As cities continue to grapple with pressing mobility issues, co-creation of technology solutions offer a promising pathway towards building more resilient, accessible, and equitable transportation systems that serve the needs of all urban dwellers [22]. Co-creation of technology solutions for urban mobility issues is a collaborative endeavour that integrates diverse perspectives and expertise to develop innovative and effective responses [21]. By engaging stakeholders, fostering experimentation, and promoting inclusivity, co-creation initiatives have the potential to address urban mobility challenges holistically and sustainably, leading to more efficient and equitable transportation systems in cities worldwide through implementing user-friendly state-of-the-art technologies.

Co-creation of technology-driven solutions has emerged as a fundamental strategy in addressing the complex challenges inherent in designing future mobility services. Ebbesson [23] emphasises the inherently nature of mobility challenges, necessitating collaboration between private partners, the public sector, and citizens, often with competing goals and value systems. Following this approach aligns well with a Living Lab methodology, which has gained traction in recent years as a means to address such complex issues [24]. Importantly, these represent a paradigm shift in innovation ecosystems, offering a dynamic platform for open collaboration and experimentation within real-life settings. As articulated by Akasaka et al. [24], Living Labs embrace a design approach that actively involves users as partners from the early stages of the innovation process, fostering long-term and complex user participation. Unlike traditional participatory design approaches, Living Labs engage stakeholders in iterative feedback processes throughout the innovation lifecycle, from problem exploration to idea generation, prototyping, and testing [25].

Successful co-creation initiatives illustrate their transformative impact across diverse contexts. Urban Living Labs serve as platforms for co-creative urban development, actively involving users in design processes [24]. Similarly, collaboration in urban mobility Living Labs emphasises co-creation and end-user engagement to drive innovation [26]. In Europe, various initiatives have embraced a co-creation approach to address neighbourhood mobility



issues. Recognising that residents possess intimate knowledge of their communities and a vested interest in ensuring their safety and quality, these initiatives have sought to engage them in the process. For instance, as narrated by Wippoo et al. [27], ‘Cities-4-People’ adopted a grassroots approach across five European cities, inviting residents to collaboratively identify mobility challenges and develop solutions. Similarly, ‘Metamorphosis’ involved children in co-creating innovative pilot projects inspired by their imagination. ‘Looper’ integrated learning loops into the co-creation process, enabling iterative feedback to inform design and implementation stages. ‘Sunrise’ established neighbourhood mobility labs to facilitate co-creation in Sustainable Neighbourhood Mobility Planning initiatives.

3 THE SOTERIA PROJECT

The SOTERIA Project (<https://soteriaproject.eu/>), which is co-funded by the European Commission (EC) and the United Kingdom Research and Innovation (UKRI) agency, aims to accelerate the attainment of the ‘Vision Zero’ goal for VRUs through a holistic framework of innovative models, tools and services that enable data-driven road safety intelligence, facilitate safe travelling of VRUs and fostering safe integration of micro-mobility services in complex environments. At the operational level, SOTERIA engages Living Lab communities in social innovation activities for the co-creation of urban safety solutions.

The SOTERIA Project has set-up five Living Labs (across four European nations) to support its investigations (Table 1). Designing and crafting Living Labs requires the involvement of a diversity of local actors, stakeholders, collaborators and networks; thus, the project integrates the quadruple-helix voices of citizens, organisations/authorities and institutions (i.e. a type of public–private–people partnership), through a participatory activism of shared perspectives and knowledge exchange to develop environmentally, socially, economically and culturally robust sustainability-driven outcomes and practices. These forums are instruments of empowerment that enable the unravelling of unexplored human–environmental–technological solutions.

Each of these Living Labs have been and continue to be the focus for the project’s road safety innovation activities, which involve a range of engagement activities (see the project website for more information), including those reported herein.

4 METHODOLOGY

A positivist philosophical approach was taken to gain an objective understanding [28], on the assumption that knowledge is best understood through both objective observation and reason [29]. Given the adopted philosophy, a quantitative cross-sectional online questionnaire survey [30] was designed to collect a large amount of data in a controlled setting with minimal influence by the researcher. The choice of this strategy was borne out of the need to capture the opinions and preferences of VRU stakeholders.

Earlier project evidence (using World Café workshops) has already shown VRU stakeholders are keen to contribute and share their thoughts and ideas about possible road safety solutions [31]. Therefore, the online questionnaire survey was designed to investigate stakeholder views towards the creation, design and implementation of possible technology-informed road safety solutions and, in doing so, it also sought to gather insights about participant preferences towards various technology options from both existing and novel products, including the design and creation of a safe/clean routing app that the SOTERIA project intends to make available via a mobile/cell phone. This meant that participants were asked about their likings towards the proposed solutions, towards any features they wanted considered or included and also about any specific factors or issues that influence their travel



Table 1: Brief descriptions of the Living Labs used in the SOTERIA project.

Nations	Living Labs
Germany	The Free State of Saxony (SE Germany) has ~4 million inhabitants. Annually, ~100,000 accidents are registered, with ~5,500 involving VRUs. Young people (aged 10–16) are VRUs showing major changes in their mobility patterns and who are becoming increasingly active in their mobility behaviour, without, as a rule, neither sufficient awareness of the dangers in road traffic nor sufficient experience or sense for the perspective of motorised road users. This age group (often referred to as Generation Z) and their parents are smartphone and internet-savvy road users. Data of accidents in the proximity of a school and on typical ways to and from school provides the basis for piloting safe routing behavioural change and safety alerting.
Greece	Greece has two Living Labs – in the cities of Chania and Ioumenitsa there are well-established public bicycle sharing services as well as power two-wheeler-based delivery services. Both cities offer ideal testbeds for evaluating the VRUs and micro-mobility safety services with a high number of diverse groups of users making use of public bicycles, including tourists, under complex traffic situations as both cities have a port and a complex network of roads connecting the city's centre with the port.
Spain	Madrid, the capital of Spain, has a population of >3 million inhabitants. In 2021, the Governing Board of the Madrid City Council has approved a new road safety plan. The plan has as strategic objective to move towards safe mobility with zero tolerance for accidents and promote road safety habits that allow safe travel.
UK	Oxfordshire (SE England) is home to ~640,000 residents. The county consists of Oxford city and four other districts. Oxfordshire County Council manages over 4,200 km of its roads, which are used by ~325,000 registered vehicles. Annually, an estimated 30,000 accidents of all types, around 30 deaths, 245 serious injuries and nearly 1,250 slight injuries are reported. The local transport plan (2015–2031) has identified the need to support active travelling initiatives. However, successful attainment of the defined goals requires the introduction of solutions that will improve the safety of VRUs.

decisions and choices; whereby, participants record their responses on five-point Likert-type scales [32] (e.g. 1 = never, 2 = sometimes, 3 = almost half of the time, 4 = most of the time, and 5 = always; or 1 = strongly disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, and 5 = strongly agree).

An online Qualtrics XM platform was used to host the survey questionnaire and to collect the participant responses. The survey questionnaire was made available in several languages (i.e. English, German, Greek and Spanish) and, as such, weblinks were shared with potential participants from across each of the SOTERIA Living Labs. Data collection commenced on 30 September 2023 (and still continues (Table 2)). The data, up to 31 December 2023 (the first 3 months) was downloaded and stored in accordance with the expectations of GDPR regulations. The datasets for each nation were then cleaned and analysed using MS Excel (version 2019) and IBM SPSS Statistics (version 29.0.1.0).

Table 2: Participants were able to access the questionnaire in various European languages via the following online links, which remain open and are still collecting data.

	Online access links to each of the national questionnaires
English	https://uwe.eu.qualtrics.com/jfe/form/SV_dopsjmjg0eVa8YK
German	https://uwe.eu.qualtrics.com/jfe/form/SV_2lTbrJopI75uRDg
Greek	https://uwe.eu.qualtrics.com/jfe/form/SV_0ikexUBTVdF63MG
Spanish	https://uwe.eu.qualtrics.com/jfe/form/SV_1GOa8NZk9U1KCIS

Ethical approval for the research was granted by an independent ethics committee before data collection was embarked upon. This approval means the consent of all participants was sought prior to them commencing the questionnaire. Once gained, consent meant all participants were informed that their involvement in the study was entirely voluntary. Further, since the data collected would be anonymous, at the end of the questionnaire all participants were invited to create their own unique identification code that they could later quote in an email if they decided to withdraw their data responses within a 2-week window from the date of their involvement. This procedure is compliant with the expectations of university research ethics regulations throughout Europe [33].

5 RESULTS

This section is divided into two subsections: (i) participant profiles; and (ii) participant responses.

5.1 Participant profiles

Findings from the questionnaire survey, which was shared with stakeholders residing in each of the Living Labs (i.e. Saxony in Germany; Igoumenitsa and Chania in Greece; Madrid in Spain; and Oxford in the UK), generated responses from 719 participants, with most replies chiefly coming from pedestrian (52%) and cyclist (29%) stakeholder groups. The demographics of the participants based on their gender and age are shown in Tables 3 and 4. These show a fairly good balance of responses across the genders (male 58:42 female). The age groups with the highest response rates were 45–54 years (27%) and 35–44 years (25%).

5.2 Participant responses

Personal road safety was an acknowledged concern for many (97%) of the VRU participants, and this was common to all stakeholders in each Living Lab (98% in Germany; 99% in Greece; 96% in Spain; 97% in the UK). Furthermore, 88% of participants claim that their choice of travel route was often determined by its perceived safety risk. Responses across the

Table 3: Percentage breakdown of participants based on the genders of the respondents and for each of the Living Lab nations.

GENDER							
MALE 58%				FEMALE 42%			
Germany 67%	Greece 57%	Spain 60%	UK 56%	Germany 33%	Greece 43%	Spain 40%	UK 44%



Table 4: Percentage breakdown of participants based on the age ranges of the respondents and for each of the Living Lab nations.

AGE															
18-24 0%				25-34 15%				35-44 25%				45-54 27%			
55-64 22%				65-74 9%				75-84 3%				>85 0%			
Germany	0%	Greece	2%	Spain	0%	UK	0%	Germany	28%	Greece	11%	Spain	10%	UK	15%
Germany	30%	Greece	38%	Spain	40%	UK	22%	Germany	21%	Greece	40%	Spain	15%	UK	27%
Germany	17%	Greece	7%	Spain	23%	UK	19%	Germany	5%	Greece	2%	Spain	11%	UK	12%
Germany	0%	Greece	0%	Spain	2%	UK	4%	Germany	0%	Greece	0%	Spain	0%	UK	1%

living labs are fairly similar, with 86% in Germany; 94% in Greece; 85% in Spain; and 89% in the UK.

Gauging potential interest and uptake of any new or alternative road safety solutions are heavily reliant on the input and insights gathered from prospective users. Based on the responses received, physical attachment of technology-informed road safety products to micro-mobility devices or the suggestion of VRUs wearing similar products was considered an unpopular solution amongst the participants, with only 33% indicating their support for the adoption of these products. This preference was greatest in the UK (38%) and Greece (36%) and notably less so in Germany (13%) and Spain (18%). Participants were also asked to express the views on the creation of a safe/clean routing app that are proposed to be made available via a mobile/cell phone. This received much greater enthusiasm, with 74% indicating that they would be interested in using the app being developed by the SOTERIA project. Responses across the living labs towards the app, ranged from 72–82%, with 82% in Germany; 72% in Greece; 81% in Spain; and 77% in the UK. In recognition of this enthusiasm, and in the interests of co-creation, it is important to know what particular features and facets potential users would like to see incorporated into the proposed safe/clean routing app. That said, participants were asked how likely they would use a pre-journey planning function that would help them avoid possible high-risk or accident hot spots. Responses indicate that 71% of participants would want to use this function. Responses across the living labs were 74% in Germany; 83% in Greece; 74% in Spain; and 66% in the UK. Further, participants were asked how important it was that the app selected fast routes. Responses indicate that this was an important feature, with 81% of participants wanting this function. Responses across the living labs were 88% in Germany; 75% in Greece; 86% in Spain; and 76% in the UK. Concomitantly, when deciding on an alternative safe/clean travel route, participants were asked how many additional minutes they would be willing to add to their journey time to improve their safety. Responses indicate more than half of the participants (53%) are willing to accept up to ten additional minutes to their travels. Responses across the living labs for the same number additional minutes were 47% in Germany; 69% in Greece; 48% in Spain; and 45% in the UK.

In terms of user requirements and their preferred safe/clean travel routes, participants were asked about particular desires and features that influence their normal choice of route. Most participants (88%) indicated their choice of travel route was often influenced by the type of road infrastructure (e.g. roundabouts, designated lanes, etc.) that may encounter on their journey. Responses across the living labs are relatively similar, with 90% in Germany; 92% in Greece; 87% in Spain; and 87% in the UK. Moreover, most participants (82%) indicated

their preference, when possible, was to choose a route away from roads with fast-moving vehicles. This preference was greatest in Greece (85%) and the UK (82%) and marginally less so in Germany (72%) and Spain (79%). Most participants (81%) indicated their preference, when possible, was to access public parks (e.g. green infrastructure) when choosing a route. Responses across the living labs were 80% in Germany; 87% in Greece; 85% in Spain; and 75% in the UK. Almost two-thirds of participants (67%) indicated their preference, when possible, was to travel alongside a waterway (e.g. river, canal, lake) when choosing a route. Responses across the living labs were 60% in Germany; 74% in Greece; 57% in Spain; and 71% in the UK. Many participants (79%) indicated their preference, when possible, was to use a designated pedestrian, cycle or bridleway when choosing a route. Responses across the living labs were 91% in Germany; 88% in Greece; 86% in Spain; and 80% in the UK. Almost two-thirds of participants (64%) indicated their preference, when possible, was to choose routes that avoid hills. Responses across the living labs varied, with 50% in Germany; 71% in Greece; 69% in Spain; 64% in the UK. Many participants (77%) indicated their preference was, when possible, to choose a route with plenty of streetlights. Responses across the living labs were 64% in Germany; 83% in Greece; 69% in Spain; and 80% in the UK. Over half the participants (53%) indicated their preference, when possible, was to choose a route with plenty of signposts. Responses across the living labs varied, with 37% in Germany; 62% in Greece; 38% in Spain; and 57% in the UK. Most participants (83%) indicated their route preference was influenced by the road/pavement surface type/conditions. Responses across the living labs were similar, with 82% in Germany; 90% in Greece; 83% in Spain; 84% in the UK.

Options for app users to receive updates during their journeys were also considered. Participants were asked whether they wanted to receive in-journey pop-up notifications (e.g. proximity of high-risk points or suggested travel speeds). More than half of the participants (52%) would like this feature to be available. Responses across the living labs varied from 34% in Germany; 57% in Greece; 46% in Spain; and 53% in the UK. Participants were asked whether they wanted an on-trip app function that can provide safety related audible notifications. More than half of the participants (58%) would like this feature to be available. Again, responses across the living labs varied, with 47% in Germany; 64% in Greece; 57% in Spain; and 56% in the UK.

Participants were asked to consider important post-journey features and information. For instance, participants were asked if they may want the proposed safe/clean routing app to allow them the opportunity to provide user feedback about the accuracy of the information they received about their route. Responses indicate that this was not a popular feature that users would want to use, with only 52% wanting this function to be available. Responses across the living labs were 30% in Germany; 56% in Greece; 53% in Spain; and 53% in the UK. Participants were also asked if they may want to receive post-journey statistical information from the proposed safe/clean routing app about the route they travelled. Whilst slightly more popular, the responses indicate that approximately half of the participants (52%) would want to use this function. Responses across the living labs varied widely, with 28% in Germany; 50% in Greece; 60% in Spain; and 56% in the UK.

6 DISCUSSION

The insights gathered from this pan-European survey underscore the heightened priority and demand for personalized road safety solutions specifically for VRUs. While crucial advancements have been made in vehicle and infrastructure safety, the risk mitigation needs of VRUs remain underserved. This study refines and elaborates this gap by revealing key preferences of VRUs towards a potential safety tool.



A central theme of the responses is a strong inclination towards a personalized routing app that offers safe and clean route options. Participants' feedback reflected interest in being guided along faster routes that also steer them away from heavy road traffic, with a distinct preference for paths incorporating designated pedestrian and cyclist lanes, green infrastructure, or blue corridors like riversides and canals. These preferences suggest that VRUs aspire to physical safety, psychological comfort, and environmental quality. This aligns with overarching sustainable urban mobility goals of many nations [34], [35], where health, wellbeing, and climate considerations converge with accessibility and safety.

On-route street lighting was another feature consistently prioritised by participants, along with proper signposting. These responses point to the dual importance of visibility and perceived security, which may be just as vital as navigational clarity. Furthermore, the pavement surface type and condition were also cited as critical factors, especially by individuals with mobility challenges, plus those using bicycles or scooters. These insights suggest the need for environmentally responsive functionalities within a routing application, capable of integrating context and infrastructural data alongside dynamic user preferences.

The survey results also reveal key divergences in accepting different safety solutions. While digital routing apps received strong support, wearable or physically attached safety devices were far less popular solutions. Interestingly, support for wearable tech varied significantly across countries, with the UK and Greece showing higher acceptance than Germany and Spain. These differences suggest that cultural and national contexts likely contribute to this disparity and, as such, must be considered in the development and deployment of safety technologies [36].

Despite these divergences, there is a strong shared concern for personal safety across nations. Nearly all participants identified road safety as a significant concern, and most suggest these concerns influence their route choices. Such uniformity across diverse geographies highlights a collective need for safety interventions and validates the relevance of an app-based solution designed around VRU preferences. Moreover, this could influence the demand for more personalised transport services (e.g. Mobility as a Service (MaaS)).

The diversity of survey respondents, in terms of geography, age, and mode of transport, further reinforces the relevance of these findings across various European contexts. However, it also signals the limitations of universal solutions. Instead, the future of road safety technology lies in developing versatile and responsive tools that adapt to local infrastructure, cultural expectations, and specific mobility patterns. The clear willingness among VRUs to participate in further testing and offer feedback supports the SOTERIA project's co-creation approach and strengthens the case for integrating user input throughout the design, development, and evaluation lifecycle [37].

Overall, this study strongly advocates including user preferences in road safety solutions. By leveraging these insights, a routing app can evolve into a sophisticated, user-centred tool that not only enhances safety but also fosters greater independence and confidence among VRUs. Sustained VRU engagement, iterative testing, and interdisciplinary collaboration will be essential in refining and scaling this solution for broader societal impact. As cities strive to become safer and more inclusive [38], integrating digital innovation user insight will be a key pathway to realising equitable and effective urban mobility systems.

7 CONCLUSIONS

This study sought to reveal the opinions and preferences of VRU stakeholders towards the design and implementation of possible road safety solutions. The findings reveal nearly all stakeholder groups from across all the SOTERIA Living Lab nations (Germany, Greece, Spain and the UK) are concerned about road safety. Consequently, it was perhaps not



surprising that there is strong interest from participants in technology-informed road safety products, such as the creation of SOTERIA's safe/clean routing app.

In terms of the app features, there was support for a pre-journey planning function, with a preference towards fast routes but away from fast moving vehicles, ideally along designated pedestrian, cycle or bridleways and/or through/near green infrastructure (e.g. public parks) or alongside waterways (e.g. rivers, canals). On-route streetlighting was considered more important than on-route signposting but road/pavement surface type/condition was of greatest importance. The less important features of the SOTERIA routing app include in-journey pop-up notifications, safety-related audible notifications and post-journey statistics or feedback options, with approximately only half of the participants requesting these facets. It is, therefore, proposed that the insights assembled from participants be judiciously considered by project partners when designing the features and functions of the SOTERIA road-safety app.

Since the SOTERIA project partners have access to both existing and novel technology-informed road safety products, and using the precedent of co-creation, it is proposed that any trials and testing should further engage VRU participants to evaluate the road-safety products and these should gather user feedback to gauge their views about the products to enhance their performance and potential market uptake.

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