Journal of Infrastructure, Policy and Development 2024, 8(15), 10246.
https://doi.org/10.24294/jipd10246

Article

An examination of public perspectives on cycle infrastructure projects: An Irish case study

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CITATION

Butt MH, Higgins R. (2024). An examination of public perspectives on cycle infrastructure projects: An Irish case study. Journal of Infrastructure, Policy and Development. 8(15): 10246.
https://doi.org/10.24294/jipd10246

ARTICLE INFO

Received: 13 November 2024
Accepted: 2 December 2024
Available online: 16 December 2024

Abstract: Increasing levels of everyday cycling has many benefits for both individuals and for cities. Reduced traffic congestion, improved air quality and safer spaces for all vulnerable road users are among the significant benefits for urban developments. Despite this, public opposition to cycling infrastructure is common, particularly when it involves reprioritising road space for cycles instead of vehicles. The purpose of the research was to examine various stakeholders' perspectives on proposed cycle infrastructure projects. This study utilised an innovative data collection approach through detailed content analysis of 322 public consultation submissions on a proposed active travel scheme in Limerick City, Ireland. By categorising submissions into support, opposition, and proposals, the study reveals the nuanced public perceptions that influence behavioural adaptation and acceptance of sustainable transport infrastructure. Supportive submissions, which outnumbered opposition-related submissions by approximately 2:1, emphasised the need for dedicated cycling infrastructure, enhanced cyclist safety, and potential improvements in environmental conditions. In contrast, opposition submissions focused on concerns over car parking removal, decreased accessibility for residents, and safety issues for vulnerable populations, particularly the elderly. Proposal submissions suggested design modifications, including enhanced safety features, provisions for convenient car parking, and alternative cycle routes. This paper highlights the value of structured public consultation data in uncovering behavioural determinants and barriers to cycling infrastructure adoption, offering policymakers essential insights into managing public opposition and fostering support. The methodology demonstrates how qualitative data from consultations can be effectively used to inform policy by capturing community-specific needs and enhancing the design of sustainable urban mobility systems. These findings underscore the need for innovative, inclusive data collection methods that reveal public sentiment, facilitating evidence-based transport policies that support climate-neutral mobility.

Keywords: cycling infrastructure; public consultation; bikelash; sustainable transport; evidence-based policy; thematic analysis; urban mobility; active travel

1. Introduction

Global analyses have made it clear that radical transitions are required to decarbonise every sector of society, including transport (IPCC, 2023; UNEP, 2023). The transition towards more sustainable forms of travel, such as cycling, emerges as a significant intervention with the potential to mitigate both car dependency and the associated greenhouse gas emissions (Carroll et al., 2019; Higgins and Ahern, 2021; Roy et al., 2022; Valentini et al., 2023). To align with the European Union's Green Deal, which aims to have no net emissions by 2050 (European Commission, 2020), governments need to incorporate transport initiatives that encourage a change in modes towards low-emission vehicles. In recent years, many municipalities across

Europe, UK and Canada have implemented strategic measures and policy frameworks aimed at fostering cycling as an integral component of urban mobility and infrastructure (Government of United Kingdom, 2023; Küster, 2019; Vijayakumar and Burda, 2015). Despite the many positive outcomes that have accrued from these initiatives, there are examples from many cities (Vancouver, Toronto, Virginia, Tasmania, Thessaloniki and Galway), where cycling infrastructure has been met with such opposition that the respective infrastructure was removed following construction (Arancibia et al., 2019; Burke, 2022; Katsavounidou et al., 2023; Robartes et al., 2021; Siemiatycki et al., 2014; Vreugdenhil and Williams, 2013; Wilson and Mitra, 2020). In one example, in Galway, Ireland, the cycle route funding was used to finance the costs associated with the removal of cycle lanes following local opposition (Ginty, 2023). The phenomenon of public opposition to cycling projects has evolved in the past decade and termed as "bikelash" (Wild et al., 2017). Alder et al. (2019) and Wang (2018) ranked public opposition among the main barriers to cycle infrastructure after lack of funding. Therefore, for the successful implementation of cycling infrastructure, it is necessary to understand the reasons behind public opposition.

The public opposition to cycling infrastructure has been explored in various studies through the analyses of social media data, policy documents, media coverage, structured interview, polls, and online surveys (Ferster et al., 2020; Loyola et al., 2023; Siemiatycki et al., 2014; Widmer et al., 2023). However, few studies have analysed submissions associated with planning applications of cycling infrastructure projects, as per the authors' best knowledge based on a search (Scopus and Google Scholar data bases dated March 2024). Egan and Caulfield (2024) applied critical discourse analysis to examine political sustainability of car-based mobility and analysed 2.5% of total submissions received on a cycle lane project. Widmer et al. (2023) interviewed the project staff regarding the overview of public letters and emails received on a cycle lane project in Lausanne, Switzerland. Anciaes and Jones (2022) introduced a set of tools for designing street space which utilised public consultation data as one of the input parameters for the tool. Existing research on cycling infrastructure often focuses on technical, environmental, and policy aspects, but detailed qualitative analyses of public consultation submissions are rare. This gap limits the understanding of public sentiment and stakeholder perspectives, which are crucial for project success. While public opposition to cycling infrastructure is widely acknowledged, the specific drivers behind opposition (e.g., concerns about parking, accessibility) and support (e.g., safety, environmental benefits) remain underexplored in the literature. The question, what are prevailing themes emerging from public consultation data of a cycling infrastructure project, is still unanswered. This question bears substantial importance for stakeholders directly involved in these projects, serving as an important reminder that communities may not uniformly support efforts to enhance the "bikeability" of their cities. Unexpected public opposition can profoundly impact aspirations for promoting active travel. Staff members engaged in the implementation of cycle lanes frequently express astonishment at the intensity and sometimes hostility of the opposition encountered (Wild et al., 2017). Such opposition may impede progress, delay implementation, or even lead to project cancellations, undermining efforts to encourage sustainable transport options and address pressing urban mobility challenges. We consider a case in Ireland, the South Circular Road (SCR) Active

Travel project. The expansion of active travel infrastructure particularly "cycling infrastructure" is aligned with national commitments outlined in the Climate Action Plan 2023 and in the Sustainable Mobility Policy document, of increasing walking and cycling rates by 50% and reducing transport-based emissions by 51% by 2030 (Government of Ireland, 2022, 2023). Ireland's cycling infrastructure is considered deficient compared to EU leading cycling countries such as Denmark, the Netherlands and Germany. **Figure 1** illustrates the significant disparity in total cycle lane length per capita in Ireland, Denmark, Germany, and the Netherlands. Denmark and the Netherlands have approximately 2 metres per capita, while the corresponding rate for Ireland is only approximately 0.1 metres (Author's own work).

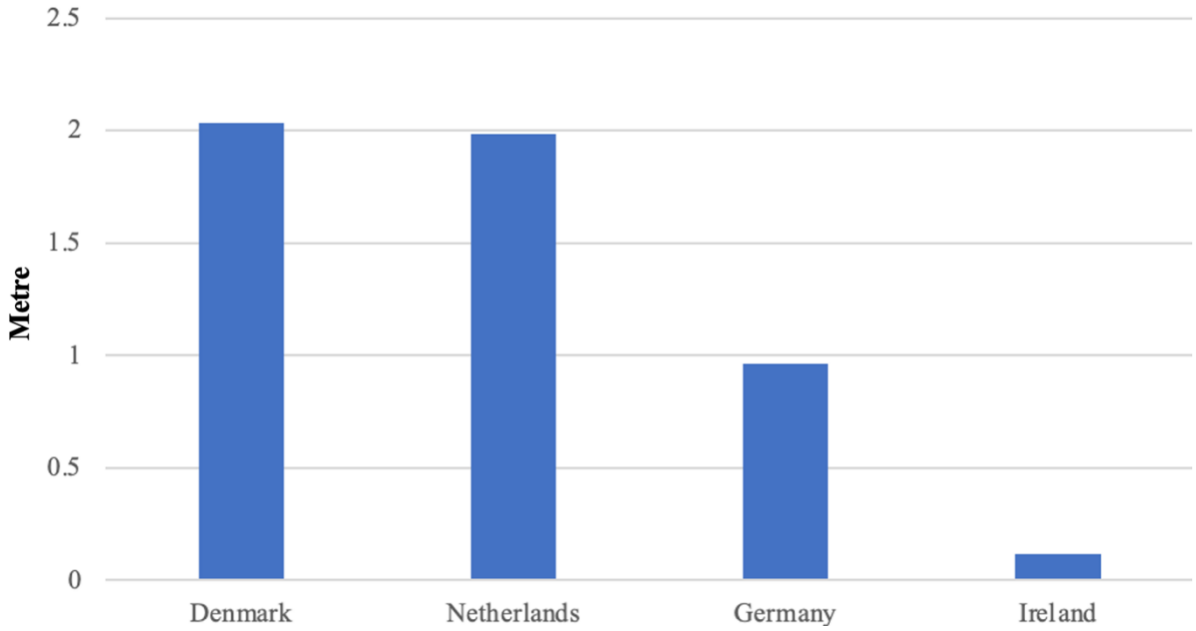


Figure 1. Total cycle lane length per capita in Ireland, Denmark, the Netherlands and Germany (Author's own work) (Central Bureau Statistics, Netherlands, 2021; Hamill, 2024; Tennant, 2022; Wenande, 2022; World Bank, 2021, 2022a, 2022b).

This has led to cycling not playing a role in reducing transport emissions (Ginty, 2023b). In the past few years, there has been an increase in the number of cycle infrastructure projects across Ireland. In 2022, the National Transport Authority completed 260 km (72 km cycle and 188 km footpath) of active travel infrastructure and aims to complete 1200 projects consisting of 1000 km (walking and cycling combined) by 2025 (National Transport Authority, 2023). On the other hand, public opposition to cycling projects was also significant on various projects, as in Galway City (Burke, 2022). Additionally, opposition to cycle lane projects has been formalised by the creation of the "Cycle Lane Action Group" (CLAG) with the primary objective of unifying individuals and communities opposed to the development and expansion of cycle lane infrastructure. To address this organised opposition to cycling, it is essential to understand the patterns behind such opposition.

The purpose of this research was to explore the perspectives of diverse stakeholders on cycling infrastructure plans, with the ultimate aim of developing a framework of strategies to address the concerns of various groups effectively. This

was achieved by analysing public consultation submissions for a proposed cycling infrastructure project in Limerick to uncover patterns of support, opposition, and actionable proposals, thereby contributing to evidence-based policies for sustainable transport. From this perspective our work attempts to answer:

How can public consultation submission analyses shed light on the patterns of opposition and support cycle lane schemes in Limerick, and what are the associated implications for cycling infrastructure policies?

The broad research question is broken into the following questions.

(1) What are the prevailing themes within the public consultation submissions on the proposed SCR active travel scheme?
(2) What are the drivers of and barriers to cycling infrastructure emerging from public consultation analysis?
(3) How can these insights contribute to the development of evidence-based policies that encourage and sustain public support for the implementation of cycle lane infrastructure?

This study makes several key contributions to the field of sustainable transport policy and the development of climate-neutral mobility systems. Firstly, it introduces an innovative approach to gathering behavioural and perceptual data by systematically analysing public consultation submissions, providing a structured and nuanced understanding of community sentiments toward cycling infrastructure. This methodology not only captures support and opposition but also identifies actionable proposals from the public, enabling policymakers to better understand specific needs and concerns, such as accessibility and safety for vulnerable populations. Secondly, by dissecting public opposition themes, the study offers insights into how accessibility concerns can drive resistance, underscoring the need for policies that address these barriers in car-dependent communities. Thirdly, the study highlights the significance of public consultation as a data source, offering a replicable model for incorporating qualitative insights into transport policy. These contributions support the broader aim of developing data-driven, community-informed strategies that can effectively promote behavioural adaptations necessary for sustainable urban mobility.

Section 2 highlights the context of the case study, and the analytical research framework used. Section 3 presents the results of the analysis categorised by themes, sub-themes and critical themes for project success and includes stakeholder analysis. Section 4 is a discussion on prominent themes, actors and policies identified and a comparison with similar national and international case studies. Finally, concluding remarks are presented in Section 5.

2. Context of study and methodology

2.1. Context

2.1.1. Study area

The proposed route of the scheme will cover approximately 2.6 km connecting the major suburbs with Limerick's city centre (**Figure 2**). The majority of the proposed route comprises a two-way cycle track. A shared street and shared street with filtered permeability also feature in the design.

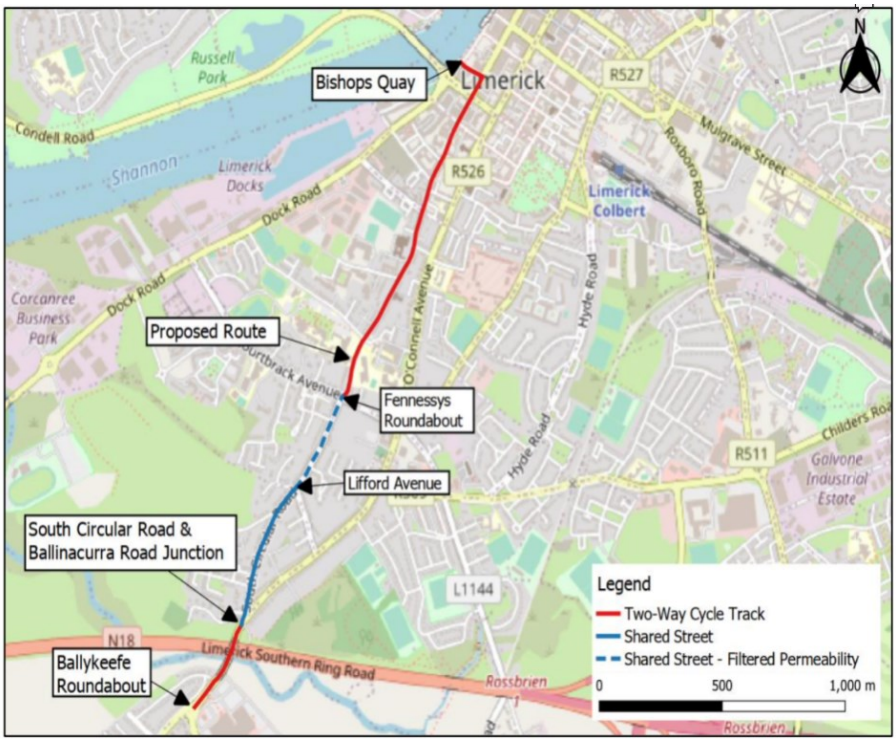


Figure 2. South Circular Road proposed cycle lane (Limerick City and County Council, 2022b).

The study area consists of three electoral divisions (EDs) with a total population of 5003 which is 4.8% of the Limerick metropolitan area population (Census 2022, 2023). Limerick city is the second most densely populated city after Dublin in Ireland with the population density of 1669/sq-km (Paul Partnership, 2024). Its significance also increases because the proposed project is planned for an area which is the 6th most densely populated ED (Dock A) in Ireland with population density of 17,027/sq-km (Central Statistics Office, 2023; Paul Partnership, 2024). Within Limerick city, the car ownership rate is 471 private vehicles per 1000 persons which is higher than the corresponding national average (Central Statistics Office, 2019; Statista, 2019). The most recent Census data for inhabitants of the Limerick city and suburbs indicates that 56.6% of the population drives, 15.9% walk and cycle and 6% use public transport (Central Statistics Office, 2022).

2.1.2. Alignment with policy

From a policy perspective, the SCR project aligns with and is supported by policies at all levels. At an international level, it aligns with the Paris Agreement, an international treaty on climate change where countries communicate actions that they are planning to take to reduce their greenhouse gas emissions (United Nations Climate Change, 2015). The national level policies (Government of Ireland, 2021) highlight the need to reduce greenhouse gas emissions by several means including through a modal shift from car driving. The Climate Action Plan 2024 sets targets of increasing active travel by 50% and decreasing escort-to-education driving trips by 30%, by 2023 (Government of Ireland, 2024).

Similarly, the National Sustainable Mobility Policy 2022–2025 document emphasises active travel and public transport as key interventions to meet the national target of reducing overall emissions by 51% by 2030 (Government of Ireland, 2022).

At the regional level, the Limerick Shannon Metropolitan Area Transport Strategy (National Transport Authority, 2022) aims to deliver high quality and more sustainable transport infrastructure in the Limerick and Shannon metropolitan area which references the SCR cycling project as a primary cycling route. At a local level, the Limerick Development Plan (2022–2028) outlines various objectives to support sustainable transport through modal split, behavioural change, and walking and cycling infrastructure, including the proposed SCR project (Limerick City and County Council, 2022).

2.2. Methodology

The study was conducted in three stages as illustrated in **Figure 3**.

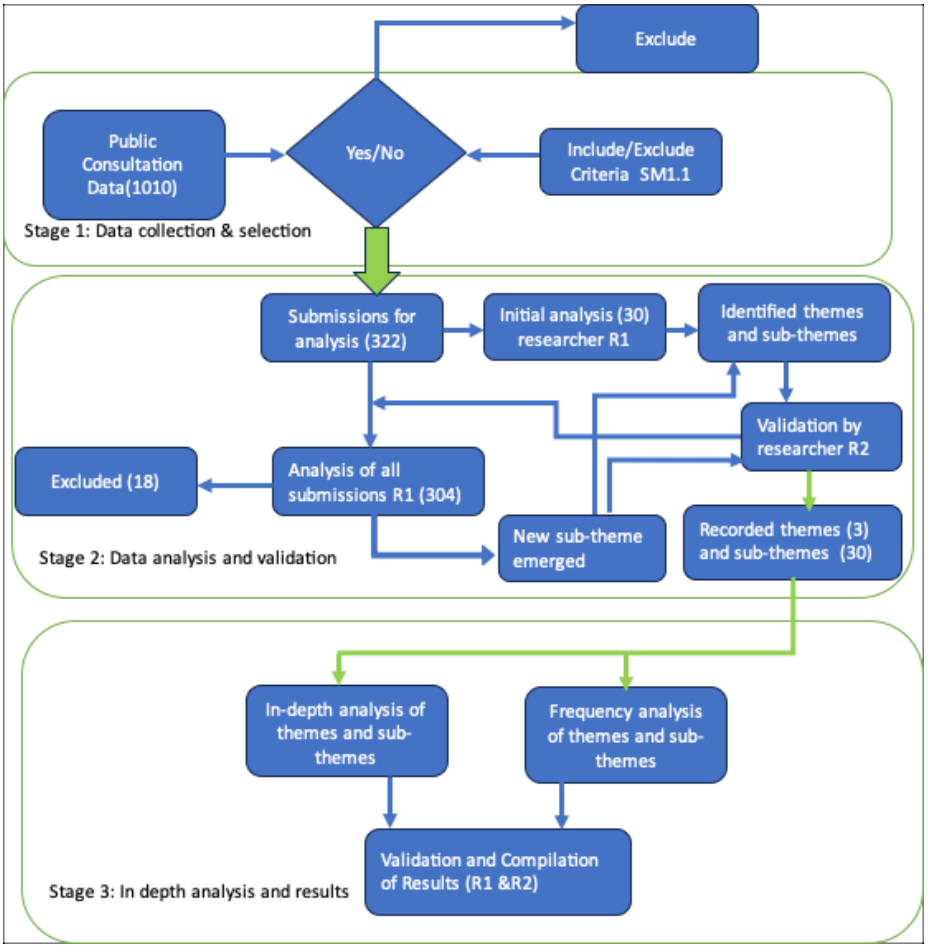


Figure 3. Research framework.

(i) Stage 1 - Data Collection and Selection. The public consultation data was downloaded from the Limerick City and County Council website and matched with the public consultation report. The details of public consultation process and submissions along with inclusion exclusion criteria are provided in supplementary material 1. A total of 322 responses were available, of which 304 were valid and analysed.

(ii) Stage 2 - Data Analysis and Validation. The submissions were analysed using a qualitative data analysis technique, the manual thematic content analysis approach (Braimah et al., 2017; Choi and Wong, 2023; Doni et al., 2019; Nairn and Rossi, 2021; Stautz et al., 2017). The detailed steps involved in the approach are explained by Miles and Huberman (1994) and by Schreier (2012). The selected methodology proves particularly apt when confronted with extensive textual datasets necessitating thorough analysis, exemplified by the abundance of "public consultation submissions" within our study. Its applicability extends across diverse disciplines mandating the examination of public/stakeholder sentiments, encompassing areas such as constitutional preferences, policy formulation, health sciences, green energy, media, and various others (Cruz et al., 2023; Delicado et al., 2017; Gajevic et al., 2009; Luo et al., 2020; Moura et al., 2022). The method's widespread utilisation underscores its efficacy in discerning patterns and extracting meaningful insights from voluminous textual data, thereby facilitating comprehensive investigations across a spectrum of domains. A total of 322 submissions were screened. 18 submissions did not meet the inclusion criteria; therefore, the remaining 304 submissions were analysed. Instead of using a sampling technique as done as others (Egan and Caulfield, 2024), all submissions were analysed. Initially, 30 responses were coded by researcher R1 and three main themes (support, concern, and suggestion), along with sub-themes, were identified. These were then validated by researcher R2 and were recorded and considered as reference for coding other submissions. The remaining submissions were coded by R1. Sub-themes that were subsequently identified by R1 were validated by R2, recorded and fed back into the iterative analysis, as recommended by Franz (2021).

(iii) Stage 3 - In-depth analysis. Prevailing themes and patterns were identified in the dataset. Sub-themes were further analysed to gain a deeper understanding of the opportunities and challenges under respective themes. Frequency analysis was performed for quantification of themes and sub-themes (Joseph and McNally, 2023). This supported an understanding of the most prevalent issues and opinions (Frelih-Larsen et al., 2023).

3. Results

3.1. Thematic analysis overview

The public consultation for the cycle lane infrastructure project yielded a total of 304 submissions, which were categorised into three main themes: "supportive", which indicates support for the initiative; "opposition", which relates to concerns and resistance to the project; and "proposals", which provide specific recommendations in relation to the project. The frequencies of supportive comment, opposition-related comments and proposals are shown in **Figure 4a**. However, in many instances, comments featured a mix of support, opposition and proposals which is illustrated in **Figure 4b**. The Venn diagram indicates the breakdown of frequencies of submissions by theme, including the intersections, highlighting distinct and overlapping areas. Specifically, 197 submissions (64.8%) were supportive, 101 (33.2%) expressed oppositions, and 136 (44.7%) included proposals. Notably, 58 submissions (19.1%)

supported the proposals, 31 (10.2%) combined oppositions with proposals, and 19 (6.3%) encompassed support, oppositions, and proposals simultaneously.

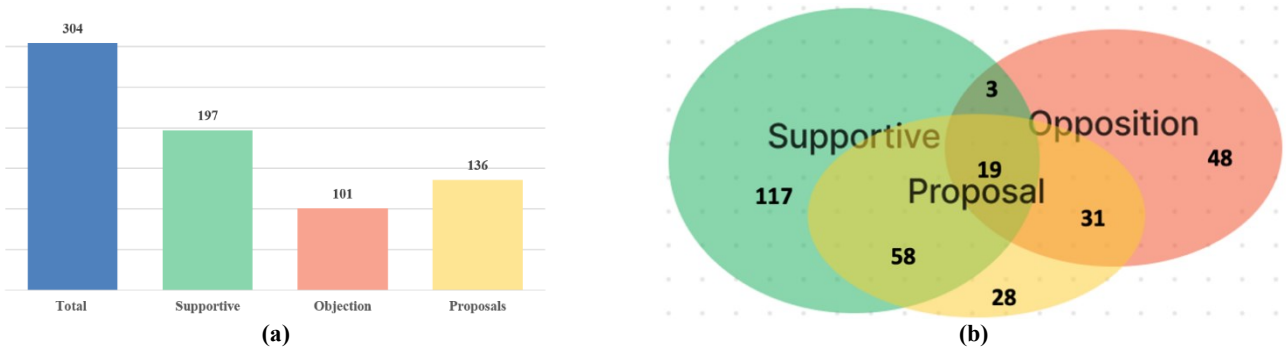


Figure 4. (a) Bar chart showing frequencies of supportive comments, opposition-related comment and proposals (including mixed responses); **(b)** Venn Diagram showing breakdown of frequencies of themes related to support, opposition and proposals. Intersections indicate frequencies of submissions aligning with more than one theme.

3.2. Supportive theme

3.2.1. Overview

Ten sub-themes were identified within the supportive theme. The frequencies of submissions related to sub-themes are shown in **Figure 5**. These sub-themes highlight the reasons for the support. The highest level of support, 49%, is ascribed to "Improved safety," with people expressing their thoughts on how the proposed cycling infrastructure will improve user safety. This is followed by "need of infrastructure," which accounted for 47% of the supportive submissions. Furthermore, "environmental benefit" received 32% support, with people recognising the positive environmental impact. Other sub-themes which also contributed to support of the project included "traffic reduction", "overall project positivity" and "behavioural change".

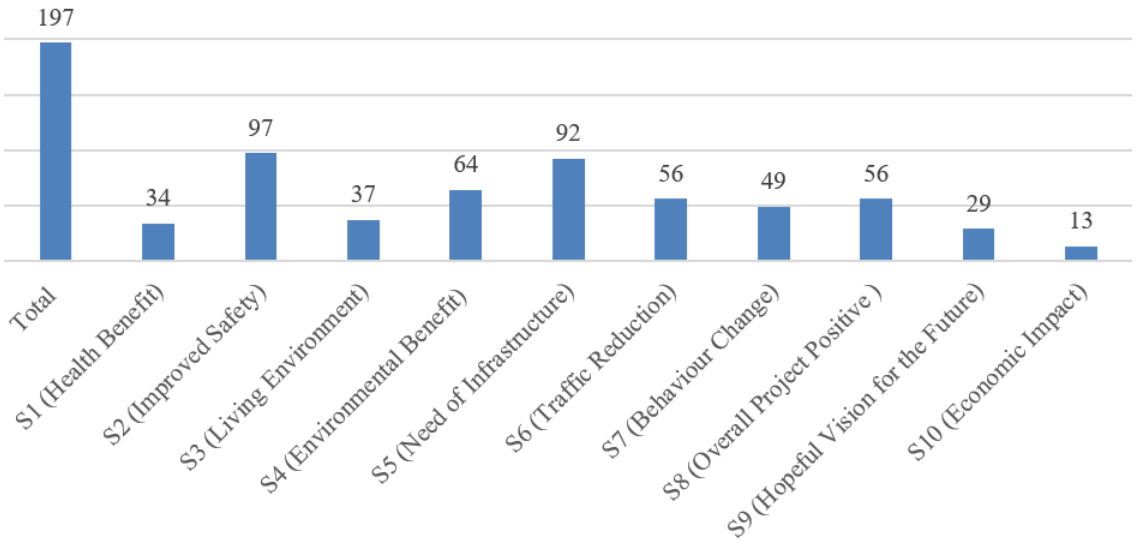


Figure 5. Frequencies of supportive sub-themes.

3.2.2. Supportive sub-themes

The following subsection comprises an analysis of the five most-cited supportive sub-themes in decreasing order of frequency. Error! Reference source not found. **Figure 6** shows a detailed analysis of all sub-themes under the "supportive" category. Combined results are provided in supplementary material 2.

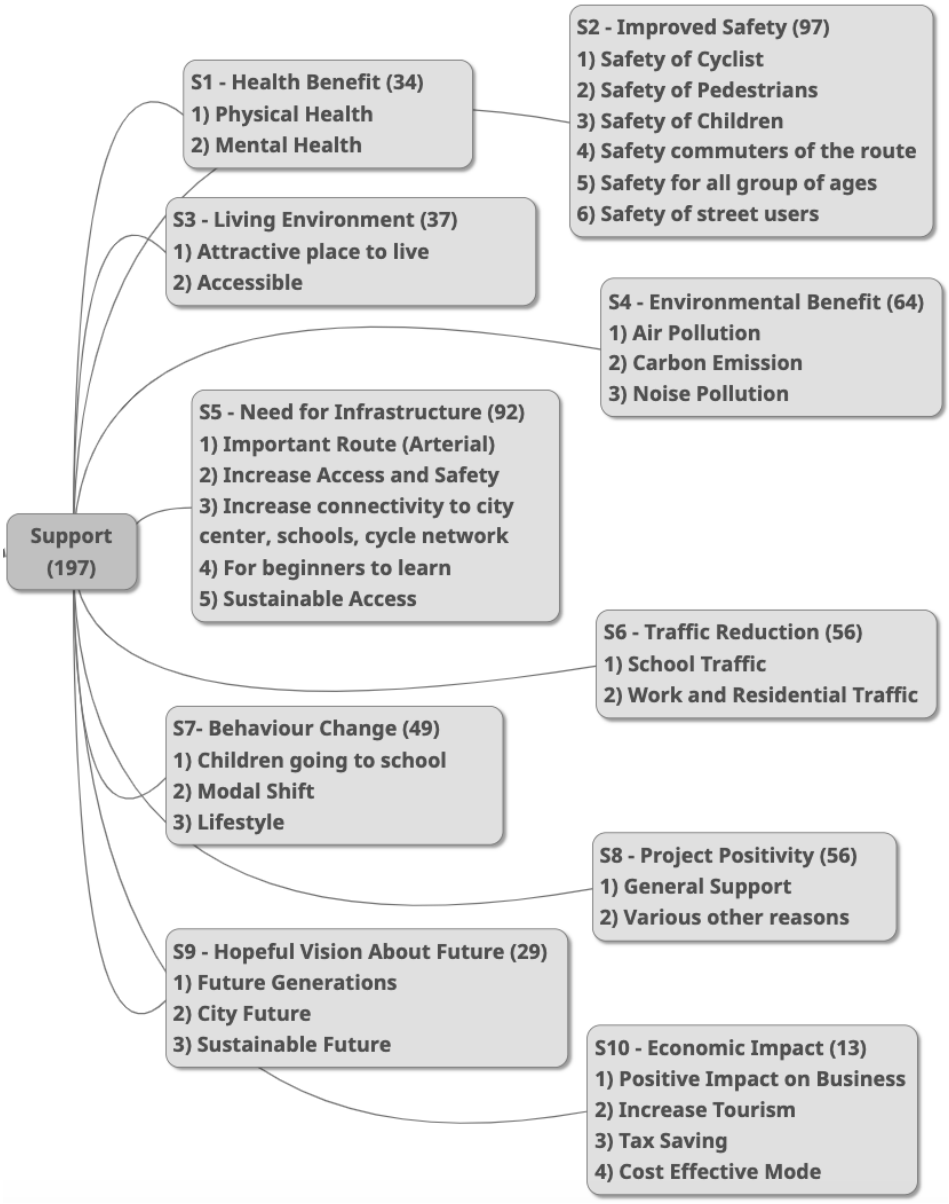


Figure 6. Detailed analysis of supportive sub-themes.

Improved Safety (S2)

Within the "supportive" category, the most frequently cited sub-theme was "improved safety" comprising almost 97 (31%) of the supportive submissions. A careful examination of this sub-theme reveals the public's endorsement for the cycle lane project, driven by the imperative to enhance safety for all groups (Reference numbers **3347**, **4168** and 4591). Refer to public consultation process and submission data in Supplementary Material 3 for full comments. Reference numbers in bold are

provided here. Reference numbers not in bold can be found at the submissions webpage.

> "... to make this route safe for people who are traveling by foot and by bike."
>
> "There are safety issues with this, both for pedestrians on the path and for those on the scooters and bikes who are at risk of getting hit by cars pulling out of driveways..."

Numerous submissions underscore the danger associated with cycling along the route in the absence of dedicated cycling infrastructure, as articulated (References 3343, 3848 and **3364**).

> "...SCR/Henry St is incredibly dangerous, and the heat map of accidents in Limerick identifies it as one of the most unsafe roads for cyclists..."

The shifting travel pattern influenced by safety concerns, with individuals opting for vehicular transport over cycling due to perceived safety hazards was revealed as a subtheme, evidenced by the following quotation:

> "Our intention was to walk or cycle as much as possible. However, increasingly, and for safety reasons and due to the very heavy traffic most mornings, it is now safer to drive than cycle."

Closely associated with the improved safety theme, some individuals reported accidents or near misses in which they were involved on the route (References **3364**, 4330 and 4335).

> "Three years ago, ... While cycling to a meeting after work, I was knocked down by a dangerous driver despite a bright afternoon, flashing lights on the bike, and a neon yellow raincoat. I was badly injured by the driver and an ambulance was called. I was placed on a spinal board with my head immobilized and the ambulance crew had to cut me out of my clothing to treat my injuries..."

Need for Infrastructure (S5)

This is the second most frequently cited sub-theme in the "supportive" category with 92 (30%) submissions. Detailed analysis of this sub-theme indicated that the proposed route is an important route which serves as a connection from Dooradoyle/Raheen to the City Centre according to various submissions (References 3369, 3840 and 4614).

> "...As the key link from Raheen/Dooradoyle/Ballykeeffe to the City Centre, it will allow nearly a quarter of the city's population to travel safely by foot or by bike..."

Various submissions also used the keyword "artery" to justify the need for cycle infrastructure on the proposed route (References **4400, 4614,** 4693, 4223, 4335, 4405 and 4480).

> "...This key artery will allow the southern suburbs access the city..."
>
> "...This is a very important missing artery in Limerick's cycle network."

Increasing safety and access is the second most cited factor within this sub-theme, "need for cycling infrastructure" (References **3356,** 3840, 3405, 3992 and 3930). Other reasons under the category of "need for cycling infrastructure" focused on "increase connectivity to city", "for beginners to learn" and "sustainable access".

> "This is a very good proposal giving access to all ages and making the area safer in general."

Other factors which played a role in building this sub-theme were "connectivity to city centre, schools, university, cycle networks", "opportunity to develop cycling skills" and "sustainable access".

Environmental Benefit (S4)

Environmental benefit was the third most frequently cited sub-theme in the "supportive" category with 64 (20%) submissions. The detailed analysis of this sub-theme reveals three types of environmental benefit (reduction in air pollution, reduction in carbon emissions and reduction in noise pollution) prevailing from this sub-theme.

The majority of the submissions within this sub-theme provided support for the project as it would reduce the local air pollution in the area (References **3364,** 3848, 3930**,** 3939, 4206 and 4249).

"...It brings to residents by reducing rat-running car traffic and the associated noise and air pollution."

A significant number of submissions highlighted the project's role in meeting national and international commitments of reducing carbon emissions (References **3930,** 4383, 4480, 4457, 4411 and 4508).

"...We need to reduce carbon emissions by 55 % by 2030 to be in line with EU regulations..."

The third most cited environmental concern also related to a local issue: noise pollution (References **3364, 3848,** 3930, 4156 and, 4206).

Traffic Reduction (S6)

The fourth most cited sub-theme, as part of the "supportive" category, related to traffic reduction with 56 (18%) submissions. The detailed analysis of this sub-theme relates to the role of the proposed project in reducing school and daily commuter traffic (References, **4674**, 4339, 4249 and 3343).

"... Introducing active travel infrastructure will provide a more efficient means of commuting, and consequently reduce traffic congestion on this route..."

Behavioural Change (S7)

Behavioural change, ranked fifth, was developed as part of the "supportive" theme and included 49 (16%) submissions. The detailed analysis of this sub-theme reveals three types of behavioural change comments. Firstly, it highlights the potential to increase "children going to school by cycling" (References **3848**, 3364, 3405 and 3878); secondly, it would enable "modal shift", from car travel to active travel (References **3992**, 4228 and 4480) and thirdly, it would lead to lifestyle change (References, 3848, 3930 and **3992**).

"The proposed changes here will empower children attending the schools to travel using active modes..."

"This has massive potential to facilitate a modal shift from cars to active travel..."

"Surely this is the type of city and lifestyle we want for our future generations..."

3.3. Opposition theme

3.3.1. Overview

Ten sub-themes were identified and categorised as "opposition", as shown in **Figure 7**. These sub-themes highlight the reasons behind popular opposition to cycle

lane infrastructure projects. Out of 101 oppositions, the most frequently cited opposition, 76%, related to the "removal of parking," with people expressing concerns over the reduction of parking spaces. This is closely followed by "impact on resident access," which was referenced among 75% of oppositions; many claiming that implementing cycle lanes would limit their access to services. Furthermore, "safety" was cited among 48% of opposition submissions.

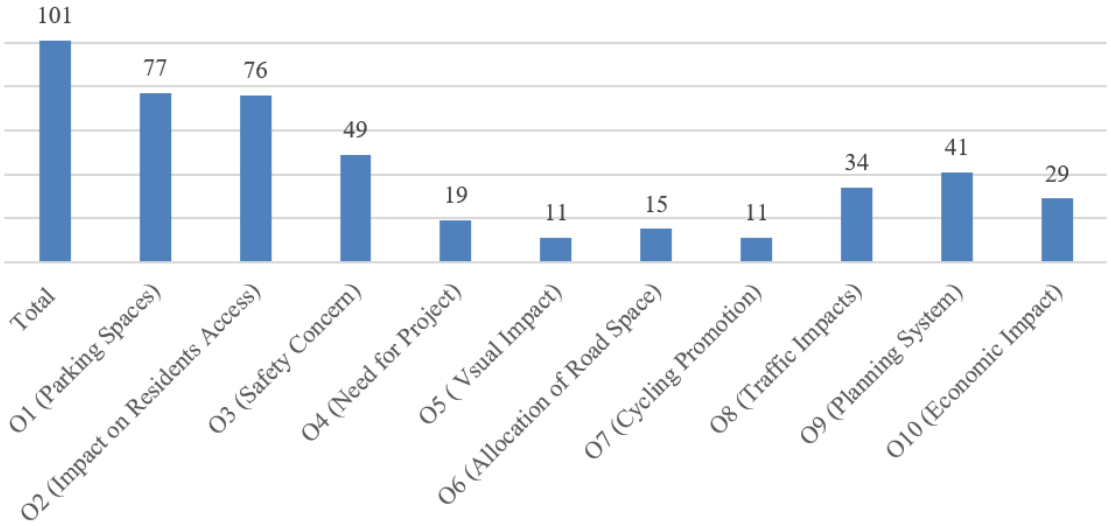


Figure 7. Frequencies of opposition-related sub-themes.

3.3.2. Opposition-related sub-themes

Commentary on the five most-cited "opposition" sub-themes are provided here and a detailed analysis of all sub-themes under the "Opposition" category is shown in **Figure 8**.

Parking Spaces (O1)

The sub-theme of parking spaces emerged as the most frequently cited issue in public consultation submissions, indicating a significant factor in the design that has led to strong opposition to the project. A detailed examination of "Parking Spaces O1" offers nuanced insights into the underlying reasons for the prominence of parking-related concerns. Key apprehensions regarding parking predominantly relate to the elderly. Concerns were expressed regarding the removal of parking spaces and advocate for the preservation of parking facilities to meet the needs of elderly individuals (References **3362**, 3400, 4055**,** 4292, 4479, 4619 and 4827).

> "Many residents of this area are elderly, and many have lived in their houses for the last 60 years or more. They need direct access parking outside their properties as a health and safety issue."

Other reasons under the category of parking focused on "parking in front of home" (Reference, 4037, 4106, 4302...), "parking far from home" (Reference, 4000, 4019, ...), "safety" in relation to parking, as shown in **Figure 8**.

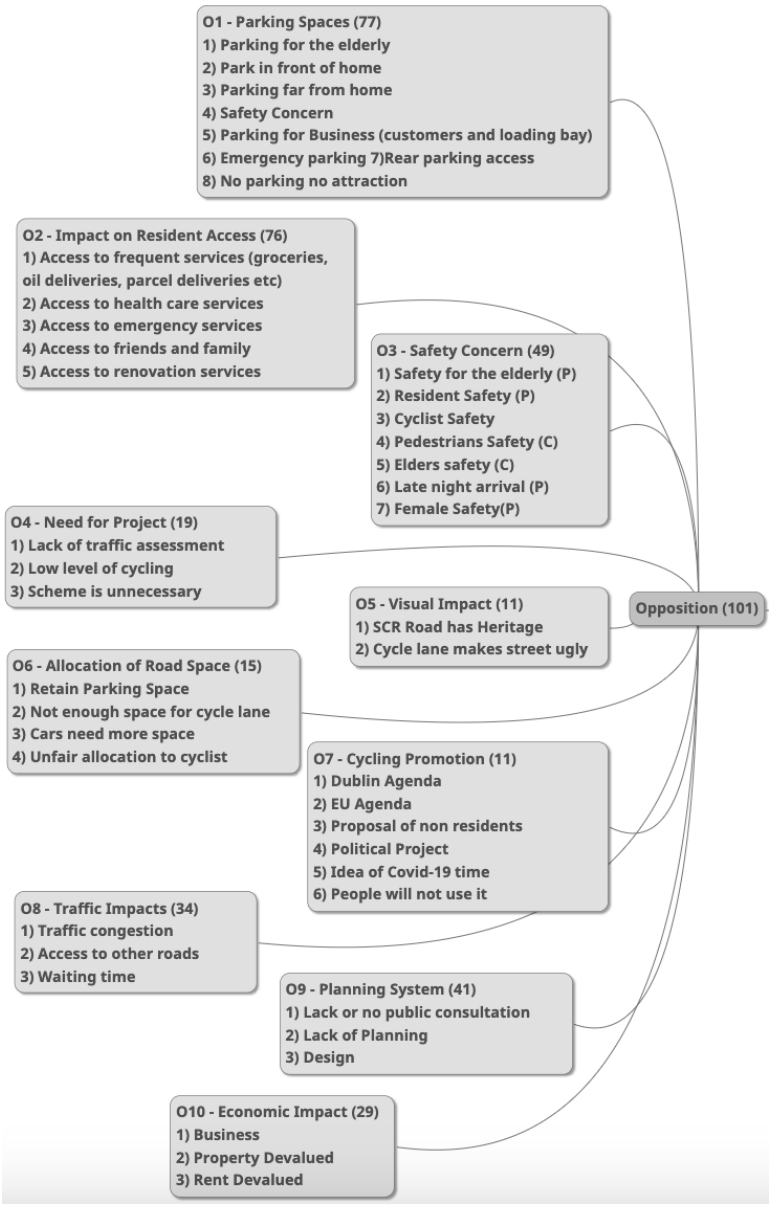


Figure 8. Detailed analysis of opposition sub-themes. (P) and (C) indicate parking-related and cycling-related factors respectively.

Impact on residents' access (O2)

The sub-theme "impact on residents' access" emerges as the second most frequently cited concern within the "opposition" category. An analysis of this sub-theme underscores the apprehension among individuals regarding the potential loss of access to essential services. The analysis identifies a plethora of services that stand to be adversely affected by the implementation of the project, with access to these services strongly linked to the availability of parking spaces. Numerous submissions relate to opposition to the project on the grounds of its perceived negative impact on their access to essential residential services (groceries, oil deliveries, parcels, home carers/helpers etc) (References 4037, **4091,** 4039 and 4125).

"How will home helpers, oil delivery's, Tesco delivery's, etc. etc. etc be able to park on the road."

Similarly, "access to health services" was often-cited as part of "impact on residents' access" and included commentary on health-service professionals, as shown in (References **3362**, 4479 and 4000) and ambulances.

> "...Also, the limited parking will impact carer and health care professionals' access to vulnerable homes..."

Furthermore, factors such as "access to emergency services," "access to friends and family," and "access to renovation services" also contributed significantly to the formation of this sub-theme, as shown in **Figure 8** and (References, 3855, 4070, 4106).

Safety Concern (O3)

The sub-theme of "safety concern" ranks as the third most cited concern within the "opposition" category. This sub-theme is characterised by various submissions highlighting perceived threats to the safety of diverse demographic groups, including the elderly, residents, cyclists, pedestrians, and females (References **3400, 3410, 3838 and 4071**).

> "... I would have safety concerns for the residents having to park in other streets in the area. ...The distance they would have to walk should also be considered as they are elderly..."
>
> "... People living there all their lives, being asked to not only watch out for cars, but also bicycles flying past their houses. Recipe for disaster and injury, especially for the older folk."
>
> "The new staggered parking on both sides will remove a clear line of sight, will heighten delays, will actually increase the danger to cyclists."
>
> "... Pedestrian safety will be negatively impacted, as the cycle lane will narrow the already narrow road width for vehicles, bringing traffic closer to the footpath."

Planning System (O9)

This was found to be the fourth most cited sub-theme within "opposition". It highlights criticism of the public consultation process for the project, emphasising the inadequacy of such consultation, coupled with deficiencies in planning and design, as the most prevalent reasons. (Reference 3**942**, 4106, 3838 and **3971**).

> "At no stage has Council Officials or Active Travel Department consulted with local residents..."
>
> "However, I think this proposal is poorly designed and ill-conceived and does not take into account the needs of the residents and business owners of Henry Street."

Traffic Impacts (O8)

Traffic impacts were found to be the fifth most cited sub-theme. It relates to public concerns on the proposed project due to its perceived impact on the flow of traffic along the proposed route. Three main factors: traffic congestion (including school-traffic), impact on the adjacent road network, and waiting times formed part of the "traffic impacts" sub-theme (Reference **3487**, 4073 and 3838).

> "... I travel to drop my son to school everyday and it is already a nightmare to then try get to work and now it will be made 10 times more difficult and cause serious traffic delays..."

3.4. Proposals theme

3.4.1. Overview

A theme associated with "proposals" was also developed as part of the data analysis. Such comments comprised suggestions for design changes, some of which were project-supportive submissions with proposals for improvements and some of which described an opposition to the project with accompanying proposals for improvements. Indeed, some of the submissions (28No.) neither indicated support or opposition but contained project-related proposals, as shown in **Figure 4**.

Out of 136 proposals, the highest proportion, constituting 41%, related to "increasing safety," with individuals advocating for more safety considerations across all age groups to be prioritised. This is followed by "convenient car parking" which represented 26% of the proposals-related submissions, as individuals recommended enhancing access to car parking facilities to augment the project's attractiveness. Additionally, an "alternative route" sub-theme was developed which accounts for 25% of these submissions. Other notable proposals include "increase access to cyclists and pedestrians" and "traffic calming" (See **Figure 9**).

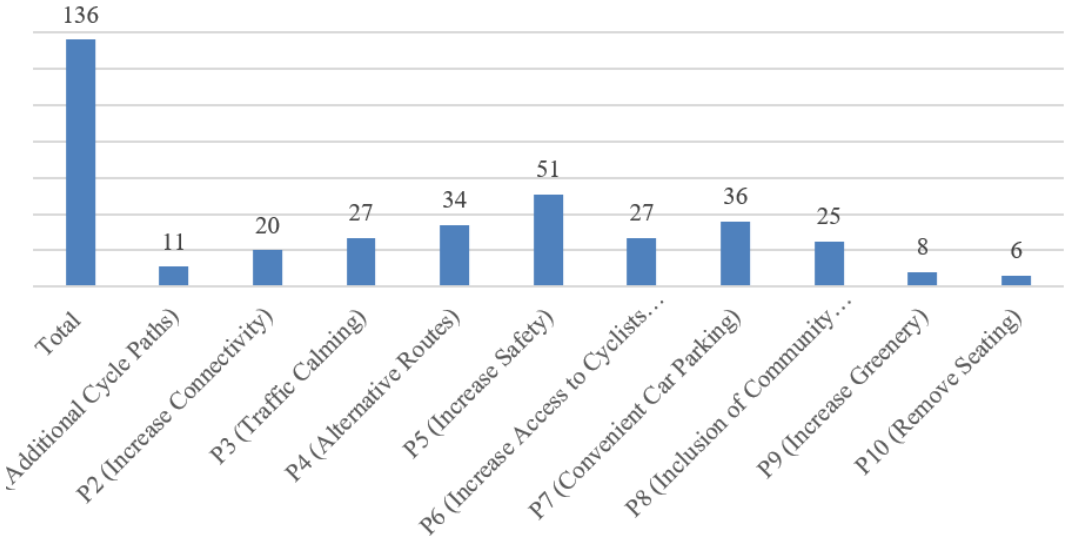


Figure 9. Frequencies of "proposals" sub-themes.

3.4.2. Proposals sub-themes

The detailed analysis of the main sub-themes within the "proposals" theme is provided here. The full list of sub-themes related "proposals" is shown in **Figure 10**.

Increase Safety (P5)

Increasing safety was the most frequently cited sub-theme within the "proposals" category. The majority of submissions include proposals to increase safety for all groups of people thus increasing the acceptability of the project in the community. Based on a frequency analysis, the safety of the elderly was considered the most referenced group, followed by those with disabilities, then cyclists and lastly pedestrians (Reference **4120,** 4619, 4138 and 4184).

> "...older persons need to have close access to a pickup and drop off facility outside their homes ... no parking/ambulance bay outside the complex is very necessary and vital for the safety of our residents and this important facility should not be removed..."

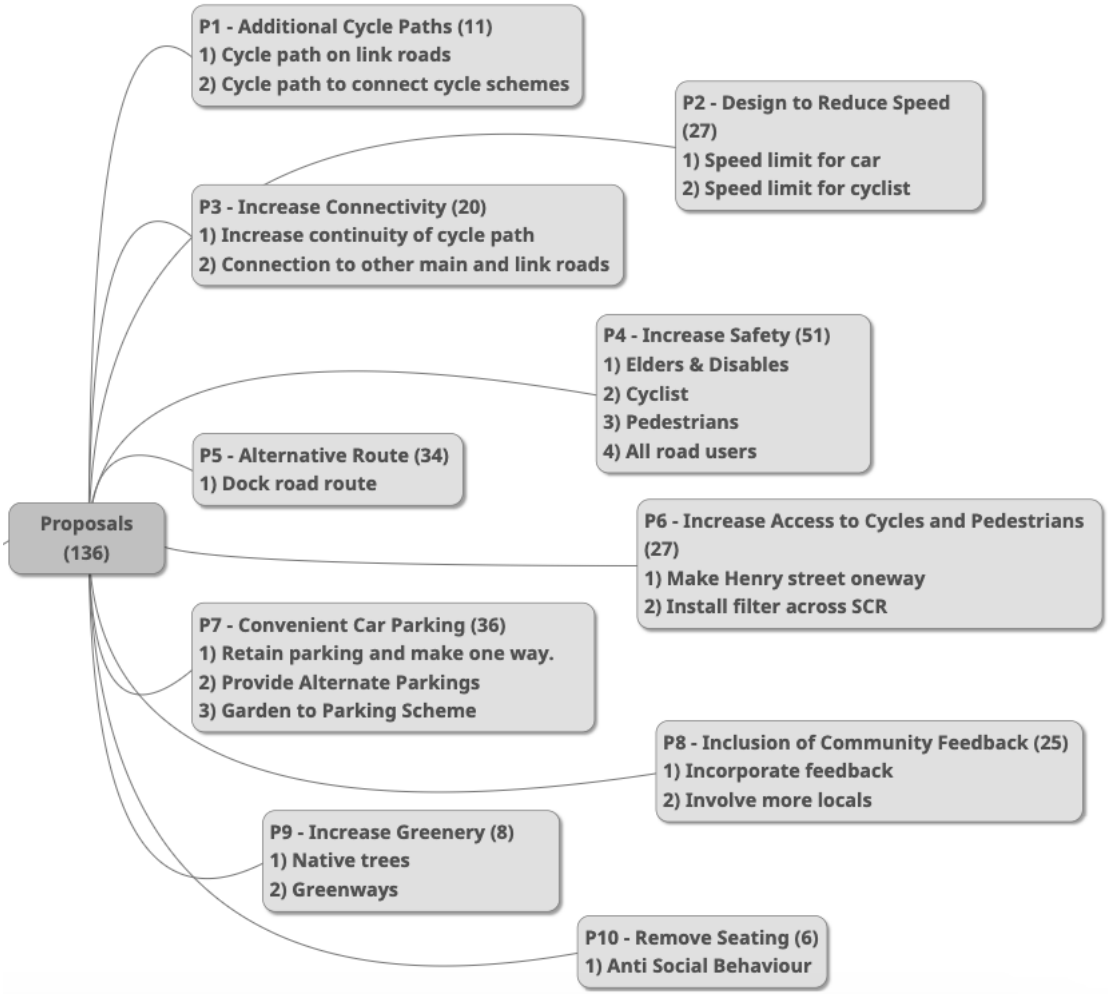


Figure 10. Detailed analysis of proposals sub-themes.

Convenient Car Parking (P7)

The sub-theme "convenient car parking" emerges as the second most cited proposal among the public consultation submissions. A significant number of submissions (34No.) which indicated opposition, showed acceptability for the project if design changes to car parking were made (References 3514, **3850**, 4000, 4019 and 4106).

> "...Please do not remove the parking, just reduce the traffic, slow the traffic, or even make the road a one-way street..."

Other proposals which contribute to this sub-theme relate to alternative parking and the provision of incentives to convert gardens for car parking (References **4194** and **4311**).

> "Replacement car parking issues for residents who lose their car spaces, needs to be addressed. Proper compensation should be provided to reflect any additional costs incurred to remodel gardens etc."
>
> "The proposals do not address the issue of residents wishing to convert either front or back garden space to be parking places."

Alternative Routes (P4)

"Alternative routes" were found to be the sub-theme comprising the third most frequently cited proposals. People who opposed the project also indicated potential

support if alternative routes were considered. The most frequently referenced alternative route was the Dock Road (References 3410, 4093, **4108**, 4189, 4241, 4244 and 4294) which runs parallel to the proposed route as shown in **Figure 2**. Other popular alternative routes were found to be the Ballinacurra Road and O'Connell Avenue.

> "May I suggest you put a cycle/walking area in the new building of the old racecourse off the Dock Road having a link path at the beginning of South Circular Road. It is a large area and would be lovely to have a park also."

Increase Access for Cyclists and Pedestrians (P6)

This was developed as the fourth most frequently proposed sub-theme among all proposal-submissions. People proposed that if the project progresses with the development of cycle lanes, sections of roads should be converted from two-way to one-way traffic (References **4055**, 4124 and 4633).

> "If the cycle lane is non-negotiable, then the obvious answer is to make all of SCR and Henry St a one-way system."

Other suggestions to increase the cyclability along the SCR include the implementation of shared road space for traffic and cyclists (References **4335** and 3933).

> "I feel that if a full filter across S.C.R was implemented current parking provision could be left as it is from the Ballinacurra junction to Fennesseys."

Traffic Calming

Traffic calming was the fifth most cited sub-theme withing the "proposals" theme. Two factors contributed to the development of this sub-theme. The first factor related to implementing design measures to reduces vehicle speeds across the proposed route to make cycling safe as referenced by **4452**. The second factor was regarding design measures to reduce cyclist speed as referenced by **4257** and many others (References 4063, 4132 and 4317).

> "As a priority - Impose and enforce a 30 Kph limit on the Ballinacurra road so that cyclists/scooters can use the Bus Lane safely."
>
> "Due to the steep incline of the bridge, cyclists heading outbound will easily reach speeds up to and in excess of 30kph."

3.4.3. Stakeholder analysis

A total of 304 valid submissions were selected for analysis, of which 158 provided demographic information. The following analysis is based on these 158 submissions, categorised by stakeholder group, and examines their support, opposition, and mixed responses towards the project. **Figure 11** presents the frequencies of submissions by stakeholder and further stratified by whether it is a supportive submission, an opposition-related submission or both. The stakeholder categories were Car drivers, Commuters, Parents, Business owners, Residents, Cyclists, Advocates for the Elderly, and Visitors.

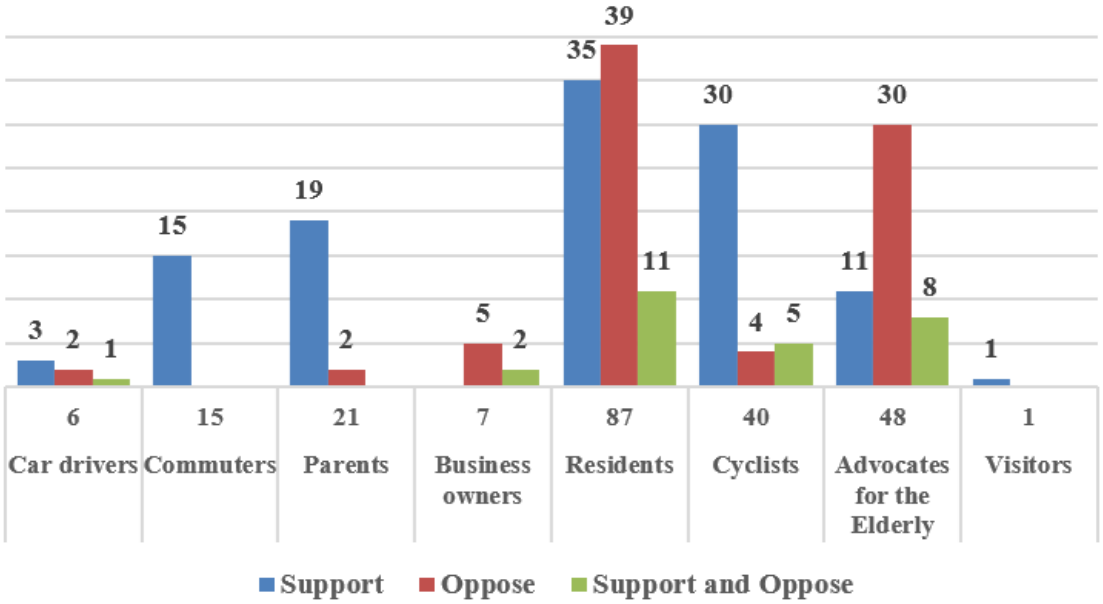


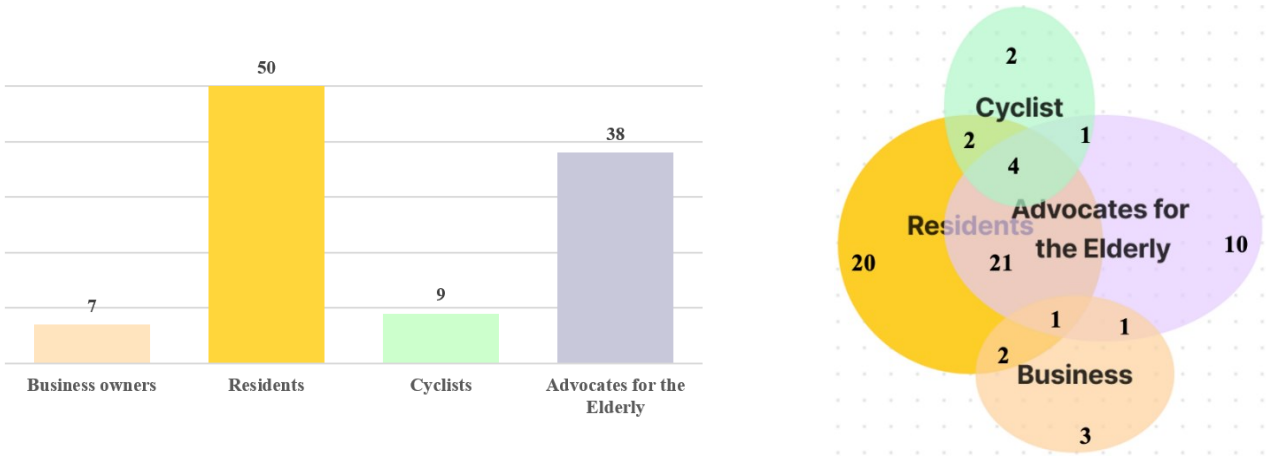
Figure 11. Frequencies of submissions by stakeholder and by support, opposition or both.

The bar chart also shows varying levels of support and opposition across the various stakeholder groups. The stakeholder category with the largest representation was the Residents with 87 submissions. There was an almost equal number of supportive comments and opposition comments (35No. and 39No.) and a small number of submissions (11No.) from Residents indicating both support and opposition.

However, in relation to the stakeholders, Advocates for the Elderly, there were significantly more opposition to the project (30No. vs 11No.) than support. However, Commuters, Parents, and Cyclists showed significantly more support than opposition for the cycling infrastructure project. Business owners exhibit a mixed response, with generally more opposition than support. There were no submissions from business owners offering support only for the project.

Details of Opposition by Stakeholder

In addition to **Figure 11**, **Figure 12a** shows the magnitude of opposition related submissions by stakeholders, **Figure 12b** shows the breakdown and overlap of the role of the stakeholders using Venn Diagram. For example, the value of 21 relates to the number of submissions from those who identified as both Residents and Advocates for the Elderly. Targeted engagement may address multiple concerns simultaneously, improving the chances of gaining broader community support.



(a) (b)

Figure 12. (a) Magnitude of opposition related submission by stakeholders; **(b)** Venn Diagram describing the frequencies of opposition-related submissions by stakeholder.

4. Discussion

The findings of SCR case study shed light on the multifaceted perspectives and concerns surrounding the implementation of cycle lane infrastructure projects, as evidenced by the thematic content analysis of public consultation submissions. Our examination of the data reveals several key themes within "supportive," "opposition," and "proposals" categories, each offering insights into various stakeholder viewpoints. Recommendations for policymakers are also provided as summarised in **Figure 13**.

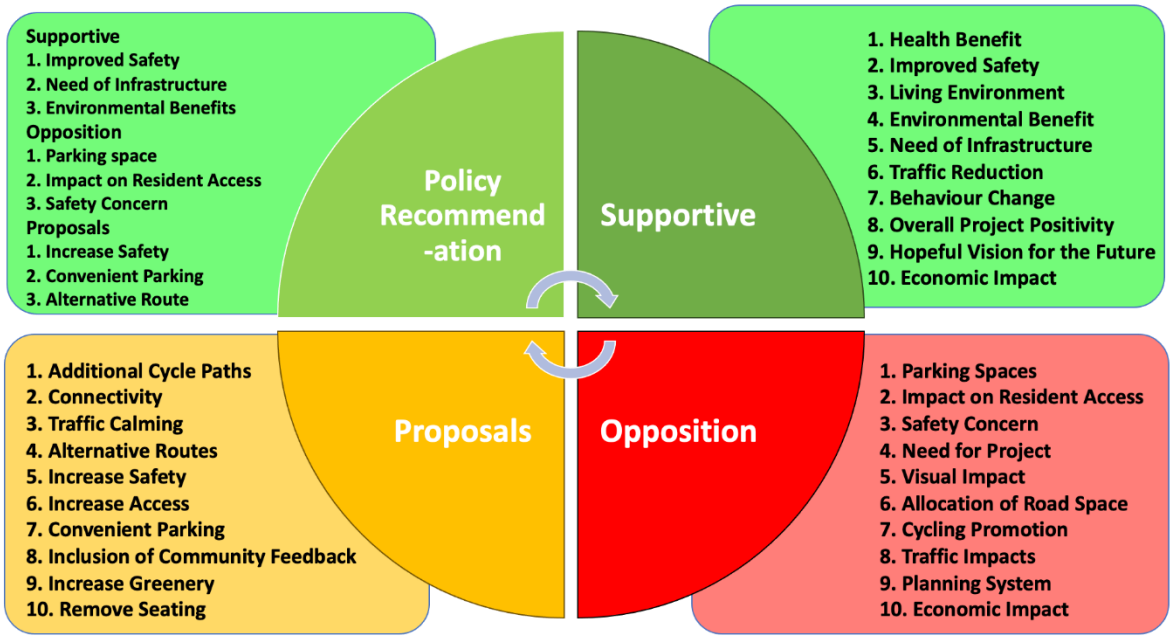


Figure 13. Policy recommendations to sustain public support for cycle lane infrastructure.

4.1. Discussion on supportive themes

The analysis of the supportive themes addresses the first research question by categorising public sentiment into 10 diverse sub-themes such as safety, need for

infrastructure, and environmental benefits which are also the drivers of the support and addresses the second questions. Safety is one of the most prominent sub-themes in this category. Participants were overwhelmingly supportive of the cycle lane proposals, citing safety benefits for cyclists and pedestrians as the key motivator. This view highlights the critical need for infrastructure upgrades targeted at improving road safety and reducing the dangers associated with cycling in urban areas. Our study finds that parents/guardians provide more support than other groups for this cycle lane project as it removes the barrier associated with mixing with traffic for children cycling to school, as shown by Fraser and Lock (2010) and by Higgins and Ahern (2021).

Similarly, people feel safer while cycling in separate cycle lanes compared to streets without cycle lanes (von Stülpnagel and Binnig, 2022). Panter et al. (2019) also concluded, in their research, that improving safety was the most important factor influencing levels of support for such projects. Our findings also align with a case study from New Zealand where an analysis of semi-structured interviews with stakeholders highlighted the need to incorporate safety in policies to build multilevel support for cycle lanes (Field et al., 2018). Cork County Council's report on the analysis of submissions on the Carrigaline Transportation and Public Realm Enhancement Plan also found that improving safety for all road users was the most frequently cited theme (Cork County Council, 2021). Therefore, improving safety needs to be considered an essential part of urban transport infrastructure design which is consistent with Gössling and McRae (2022).

Moreover, a significant number of the submissions relate to the "need for infrastructure" which demonstrates the widespread appreciation for the value of cycling facilities. With respect to "infrastructure", many of the comments related to the proposal development being an important route for facilitating connections from residential areas to various destinations including schools, offices, and the city centre.

Marqués et al. (2015) listed continuity and connectedness among essential features of a cycle network, which are intended to connect the city's major residential areas and journey points via an uninterrupted network of cycling routes. In systematic research, based on published global literature, Panter et al. (2019) found that cycle infrastructure had positive impacts on improving accessibility and connectivity. These themes of access and connectivity were also found by Kärmeniemi et al. (2018), by Winters et al. (2017), and in our findings here on factors associated with the "need for infrastructure", specifically connecting to the city, improving access and connecting cycling infrastructure.

Furthermore, researchers have identified significant positive "environmental benefits" of mass-travel towards more sustainable forms of travel. These include avoiding unnecessary trips, shifting to walking, cycling or public transport and switching to more improved vehicles, such as electric vehicles, aligning with the established Avoid – Shift – Improve hierarchical approach to decarbonising transport (Butt and Singh, 2023; Creutzig et al., 2023; Willis et al., 2014). Environmental concerns also played a role in how people supported the SCR project, with particular reference, in decreasing order of frequency, to air pollution, carbon emissions and noise pollution.

4.2. Discussion on opposition themes

The analysis also revealed ten sub-themes that were categorised as "opposition". The opposition themes are derived by parking spaces, residents' access, and potential negative safety outcomes. Within this, "Parking spaces" emerged as a central concern among stakeholders. The proposal for eliminating car parking spaces to facilitate cycle lane construction was met with strong opposition, notably from people who expressed concern on behalf of elderly citizens who, they indicated, rely significantly on available car parking. A similar observation was made in the case of the Dún Laoghaire-Rathdown (DLR) Coastal Mobility Route in Ireland, where it was found that the cycle lane project negatively affects people who "have to shop or care for elderly relatives" (Egan and Caulfield, 2024a). Removing on-street carparking spaces significantly impacts the mobility needs of the elderly, such as number of trips, social activity, access to health services and safety (Buys et al., 2012; Lu et al., 2020; Zeitler and Buys, 2014). While walking and cycling infrastructure provides opportunities for older people to improve their health (Van Cauwenberg et al., 2019), the safety needs of elderly people and those with disabilities should also be given special consideration (Pucher and Buehler, 2010).

In terms of opposition, and strongly related to the "Parking" sub-theme, above, "Impact on residents' access" also emerged a strong sub-theme. Our analysis found that the removal of car parking spaces would negatively impact accessibility for residents, in terms of facilitating regular deliveries such as groceries and shopping, visitor access, in the form of health services or friends or family, and lastly, infrequent services such as renovation works or emergency services. The negative impact of such initiatives was also found according to other cycling infrastructure projects in Ireland, where residents had concerns about cycle lanes restricting their access to shopping and other services (Donohoe, 2024; Egan and Caulfield, 2024a; Kelleher, 2022).

While there were several submissions that related to the positive safety outcomes of the proposed development, there were also a number of submissions that referred to negative safety outcomes, as found elsewhere. An analysis of three case studies on proposed cycling infrastructure in New Zealand also highlighted safety for all road users as one of the primary concerns which resulted in public opposition (Field et al., 2018). Similarly, in the case of the Tasmanian cycle lane project, due to significant criticism and safety concerns, the respective council decided to restore the road to its former condition within weeks of its completion (Vreugdenhil and Williams, 2013). Therefore, incorporating safety of all road users while designing such projects is considered crucial for project success.

4.3. Discussion on proposals themes

Our analysis of submissions also led to the development of ten sub-themes within a "Proposals" category. It is clear from the above discussion on the themes of "support" and "opposition" how safety plays a crucial role in the successful implementation of cycle lane projects. Improving safety was the most frequently cited proposal from our analysis. A case study from New Zealand indicated that proposed developments are more likely to be met with acceptance if cycle infrastructure designs maximise safety for all users (Field et al., 2018). Furthermore, in research conducted in McGill

University in Montreal, Canada, Manaugh et al. (2017) concluded that safety is one of the hurdles for non-cyclists becoming cyclists and that safety should be at the forefront in designers' minds.

Following the "increase safety" sub-theme, the next most frequently cited proposal related to "convenient car parking". The proposed design included many instances of removing existing on-street car parking spaces and providing alternative parking on adjacent streets. Many submissions indicated that this would not be ideal, and many other submissions indicated that the parking plan was ineffective. Parking is one of the most important commodities in modern market economies and is considered an essential part of cities, towns, homes, and businesses (Inci 2015; Shoup, 2018). Therefore, it is essential that convenient alternative car parking is provided in instances where on-street parking is removed.

Alternative routes were also proposed in submissions for the cycle lane project suggesting that some opposing may become supporters if the project was switched to an alternative route. This indicates that people may have different route preferences depending on their own personal situations, as found by Hardinghaus and Papantoniou (2020) in their research in Greece and Germany.

Overall, the analysis of themes and sub-themes sheds light on actionable strategies for policymakers which addresses the third research question of our study. For instance, by prioritising safety, ensuring convenient car parking, and considering alternative routes, policymakers can design evidence-based interventions that align with stakeholder preferences and mitigate opposition. These findings emphasise the importance of integrating public consultation data into the policy development process to foster community buy-in and ensure the long-term success of cycling infrastructure projects. In accordance with the third research question detailed recommendations are provided for policymakers and key stakeholders involved in such infrastructure projects.

4.4. Recommendations

To sustain public support for cycle lane projects the stakeholders, particularly local municipalities, should focus on the top three sub-themes of support, opposition, and proposals as indicated in **Figure 13**. Policy recommendations based on our analysis suggest that, in order to gain more public support, proposals for cycle lane projects should consider the following:

- Prioritise safety improvements for all road users;
- Highlight how proposed infrastructure supports connectivity and access;
- Communicate the environmental benefits of such projects by reducing local and national pollution.

To minimise public opposition, policymakers should consider the following:

- Prioritise the adoption of a holistic approach to infrastructure design which considers cycling infrastructure as part of transport planning;
- Address the residents' concern on parking and providing alternative parking such as off-street parking, accommodating permeable car parking in gardens, as part of the cycle lane project to enhance the inclusivity of such projects;

- Minimise the concerns of reduced access by highlighting how the project aims to improve access for all, particularly the elderly;
- Highlight the increased safety provided by these projects for all the road users.

Lastly, the analysis also revealed that people were not satisfied with the level consultation by local authority, and they believe that these projects are pre-planned and are being imposed on them by "outsiders". The public proposals need to be considered and addressed with proper engagement to increase inclusivity as found by Ann Ganza et al. (2022) and Jami and Walsh (2014).

By incorporating these recommendations into policy frameworks, policymakers can navigate the complexities of stakeholder interests and effectively promote sustainable forms of transport that prioritise safety, accessibility, and environmental sustainability.

5. Conclusion

This report set out to understand the full extent of public opposition to cycle infrastructure projects by using a case study from a recently designed active travel scheme in Limerick, Ireland. Understanding stakeholders' reservations to such projects may allow local governments and engineers to design infrastructure that considers such views.

This research comprised a thematic content analysis of 322 submissions that were made as part of the planning process for the 2.6 km cycle infrastructure project. Three broad themes were developed: support, opposition and proposals. Our analysis found that there were almost twice as many supportive submissions compared to opposing submissions which reflects a significant public backing for the project.

Sub-themes were developed which indicated that the main public support related to the potential health benefits, particularly for cyclists and for residents, the improved road safety for cyclists and the enhanced attractiveness of the area. In relation to the opposition theme, frequency analysis revealed that many submissions were made on car parking removal plans, and the associated decreased accessibility for residents, and on safety indicating that the project would be unsafe for some residents, especially the elderly.

Among the submissions were a number of proposals for design changes for the project including safety related changes. There were suggestions for convenient alternative car parking and alternative routes as the primary cycling corridor.

An analysis of submissions by stakeholder revealed that commuters, cyclists and parents/guardians overwhelmingly supported the proposed project; however, there was a mixture of supportive and opposing submissions from those that were profiled as residents, while there were almost three times as many opposing submissions compared to supportive submissions from advocates for the elderly. This aligns with the sub-themes developed as part of the opposition main theme, where parking and access concerns, which may affect the elderly more than other groups, were the most frequently cited of all opposition-related sub-themes.

A significant conclusion to this analysis relates to the value of public consultation for public projects. There was a large number of submissions, many opposing but the majority supporting the project and a significant breadth and depth associated with the

data as evidenced by the number of sub-themes developed and specificity of the submissions. This public consultation mechanism for such projects supports the concept that they are designed by the people, for the people. Of course, it is always necessary to develop draft plans on which the public make observations.

While the planning process including public consultation is an iterative approach, the results provided here should give designers significant design support in the development of draft plans for cycle infrastructure projects in the future. The insights gained from this research have direct implications for policymakers, urban planners, and stakeholders involved in active travel projects. By addressing common themes of opposition, such as parking concerns and accessibility, future projects can better accommodate diverse community needs, reduce resistance, and gain greater public support. Additionally, integration of stakeholder-specific proposals into project planning can improve the alignment of infrastructure designs with community expectations, enhancing the feasibility and sustainability of cycling initiatives.

However, this study has some limitations that must be acknowledged. Firstly, the research focused on a single case study in Limerick City, which limits the generalizability of findings to other regions or countries. Secondly, the manual thematic content analysis, while thorough, could have been complemented by computational methods such as sentiment analysis to enhance efficiency and reduce potential bias. Finally, the study predominantly reflects the views of those who actively participated in the consultation process, which may not fully represent the perspectives of the wider community.

Future research should aim to address these limitations by expanding the scope of analysis to include multiple case studies across national and regional levels, enabling comparisons and broader applicability. Additionally, exploring the integration of computational methods such as sentiment analysis could provide a faster and more scalable analytical framework. These efforts will help refine the understanding of public perspectives and further inform the design of inclusive and community-driven cycling infrastructure policies.

Author contributions: Conceptualization, MHB and RH; methodology, MHB; software, MHB; validation, MHB and RH; formal analysis, MHB; investigation, MHB; resources, MHB and RH; data curation, MHB; writing—original draft preparation, MHB; writing—review and editing, MHB and RH; visualization, MHB; supervision, RH; project administration, MHB and RH; funding acquisition, RH. All authors have read and agreed to the published version of the manuscript.

Acknowledgments: Limerick City and County Council. National Transport Authority, Ireland.

Conflict of interest: The authors declare no conflict of interest.

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