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Walking and cycling gaps in transport research - an international overview

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Prepared by Heather Allen
Median scl.

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Table of Contents

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Glossary

Active transport is the term used in this study to include all forms of active mobility, active travel, or active transportation and refers to the transport of people or goods by means involving human physical activity.

Infrastructure is the built environment required to support the various modes of transport, including road, rail, waterways, and air transport infrastructure, etc. Sidewalks and cycling lanes are active transport infrastructures.

Micro mobility refers to mobility achieved using any of a range of small, lightweight devices operating at speeds typically below 25 km/h, that can be owned or hired by the user.

Mobility as a Service (MaaS) is defined by the MaaS Alliance as the 'integration of various forms of transport services into a single mobility service that is accessible on demand'.[1]

Non-motorised transport encompasses all modes of transport that do not rely on an engine or motor for movement, and includes walking, pedal bicycles, rickshaws, small-wheeled transport (skates, skateboards, push scooters and hand carts).

Transport refers to the transfer of goods and/or people from one place to another. In British English transport is often used as an uncountable noun as well as verb. In American English transportation is used as a noun and transport is used as a verb. In both cases the terms refer both to vehicles and to the moving of goods or people. Transport is performed via different transport modes such as road, rail, aviation, maritime etc.

List of graphics and tables

[1] www.maas-alliance.eu

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Executive Summary

This report reviews the current state of international research and knowledge on active transport and was undertaken to identify gaps in this area of research and support the preparation of the Volvo Research and Education Foundations (VREF) Future Urban Transport research programme (FUT 3.0). The study was performed at the beginning of the COVID-19 pandemic[2] and this should be taken into consideration when reading the recommendations and conclusions.

VREF research is intended **to inform and contribute to the global research agenda on sustainable transport**. Its programmes are aligned with international policy agendas, including the Agenda 2030 Sustainable Development Goals. The VREF programme provides support for both research and education. This study looked at urban and peri-urban areas and, as the title implies, it explored potential "future looking" research areas in high-, middle- and low-income countries.

The information was collected from a rapid literature review, a 15-question Internet survey, semi-structured interviews, and a peer-review process by key actors and experts in the area of active transport. It was guided by Henrik Nolmark of VREF in early 2020. A total of **112 cleaned responses[3]** were obtained from high-, middle- and low-income countries. The survey was circulated to over 100 international email addresses including practitioners, researchers, and other active transport experts and it was also promoted via Twitter and Linked-In. The recipients of the direct email invitations were sourced from an initial review to identify key players, existing networks, and professional groupings, complemented by the researchers' networks and suggestions and recommendations from several independent sources. **Most respondents were professionally active in a broad range of areas directly or indirectly connected to the topic.**

A key finding from the review is the **high level of scholarship in active transport**. However, much of the published research tends to be context specific and not scalable (i.e., the scope was limited to a town or city, or smaller areas within these). Due to the constraints of this study, it was not possible to determine how many research papers have been produced over the past 5 years on active transport or to map the geographical sources of many of the papers identified. This was due to the sheer numbers of published articles, the wide variety of perspectives taken (including grey literature), time constraints, incomplete access to university databases and as most journals on transport are published in English[4].

Nonetheless, the review identified that there are **more technical papers published in transport (and related) journals on cycling than walking, while walking was better covered in health or combined topic journals**. Walking is well documented as the dominant mode of transport in much of the developing world, due to low incomes rather than choice, but it is not seen as a major mode of transport anywhere. Overall, it was found to be given less attention compared to cycling in transport research, but it is well covered in health and other journals (especially as a lifestyle choice or part of road safety investigations).

Research on both cycling and walking is **generally more developed in higher-income** countries. Many research papers focus on the negative safety aspects of these modes within travelling environments and also highlight the **major differences between walking and cycling.** On the other hand, reports and papers on implementation and policy frequently bundle them together and, while local actions and policies on these modes are quite well covered, there are noticeable **gaps in policy development at higher strategic levels for both**. This is further reflected in the international policy documents that were reviewed. Walking is frequently mentioned in transport policies, but there are more examples of dedicated strategies for cycling. Most references to walking are at the local level, with only a few regional or national examples of strategies.

[2] Between January and May 2020.
[3] 52 female and 50 male responses.
[4] Journals that publish in other languages were not fully considered but some rapid searches were made in French and Spanish language journals.

In addition, there are an increasing number of micro-mobility modes and initiatives operating in the urban context. These new modes intersect with active transport; however, it is not yet clear if, or how, they fit into the overall concept of active transport or the extent of research into these intersections.

No definition of active transport was provided in the survey. However, suggestions were made such as walking, cycling and micro mobility. This resulted in a slight focus of attention on passenger transport. Nonetheless, local urban freight deliveries were also mentioned and brought up in the answers to the survey questions. **Most survey respondents felt that they understood the term 'active transport',** with 58% saying that they understood the term very well. There was unanimous consensus that **walking and cycling form the backbone of active transport modes**, but there is still disagreement on whether the new alternative modes (such as micro mobility or small intermediate vehicles) should be included.

That said, there is considerable debate in academic and practitioner circles regarding the **terminology used** and people have strong opinions expressed in the survey comments and interviews. Active transport is a relatively new term but one that has been gaining support over the past decade as an alternative to the term 'non-motorised transport' (NMT). There are passionate and polarised views regarding which is the best expression to use (active transport/travel, non-motorised transport or walking and cycling). Several respondents clearly felt that active transport meant human powered transport[5] only and excluded all types of light motorised vehicles, whiles others would be happy to include such modes. Taking all the views expressed in the survey and interviews into account, the author concluded that the terms active transport and active travel (for transport) seem to connect more strongly to the mode's positive attributes (such as health benefits) than the term NMT. Active transport and active travel *for transport* were also seen as being somewhat fresher than non-motorised transport and can more readily include the new and emerging modes. The term active transport also encompasses the different needs and contexts of walking and cycling for leisure[6], (which was outside the scope of this study). On the other hand, NMT is widely used and accepted as a term to mean walking, cycling and human powered transport and many papers and it can be used more easily in search engines as a searchable key word to locate published work.

Based on the literature review of academic and policy papers and from feedback received in the interviews, **cycling is** valued more highly as a transport mode (particularly in urban contexts). The author concluded also that cycling as a transport mode is given more strategic importance[7] compared to walking and this finding was validated by the survey and the interviews. In addition, the evidence base for policy development for walking as a transport mode remains weak, and although walking is widely accepted as being part of a healthy, lifestyle choice but undervalued (beyond the health benefits to individuals) as a transport mode. Additionally, it also suffers from a lack of visibility in policy and investment contexts, especially in the developing world. However, both cycling and walking have had more research attention in the past decade compared to before.

The general opinion of those surveyed is that the subject of **active transport is not taught well in transport education**. It is frequently considered as a soft, less technical, aspect of transport, and is offered as an option rather than mandatory module within transport-related subjects. This perception is furthered by students' views that this field of transport studies is less likely to result in attractive and income generating jobs, compared to other branches of motorised transport such as road, rail, or logistics.

[5] This included some mechanised transport such as pedal bikes and rickshaws.
[6] Walking or cycling for leisure can be considered to be part of active mobility, but in the author's opinion as they lacks a transportation purpose it should therefore not be classified as active transport.
[7] See recent example from London 'A gear change for cycling and walking' https://www.gov.uk/government/publications/cycling-and-walking-plan-for-england.

A clear majority of survey respondents and interviewees expressed the perception that research on active transport modes was mostly funded by international research initiatives and philanthropic foundations. However, based on the numbers of published papers, it appears that funding primarily comes from national or local transport, or health research funding programmes. The EU Commission programme and a few university funds are the exception to this. About 20% of the respondents were unsure about funding sources. One survey question specifically asked respondents to identify their most well-known active transport research programmes, with inconclusive results. Additionally, it was telling from the survey answers that many respondents indicated that there was "not much research," while the literature review revealed that there is an extensive volume of publications on the subject. This implies that much of the published research is either not considered relevant or is not visible, and that communication and dissemination may be important aspects to include in any future research programme on the topic.

There was little difference in the **thematic areas** that were selected most consistently as priority areas for future research. The identified needs for research were:

- Equity and active transport - including gender, children and people living with disabilities.
- Recognising walking as a transport mode.
- Data collection and tools.
- The economic benefits of walking and cycling.
- Safety and security (featured in top 3 in LIC).
- Walkability (pedestrian and cycling infrastructures).
- Policy.
- Changing behaviour (more highly ranked in HIC).

Social (equity, gender) and **economic aspects, recognising walking as a transport mode,** and **tools and data** were consistently identified as topics for which there are research gaps in all regions. Additionally, changing behaviours was identified in HIC regions as a potential topic for future research, while safety and security were ranked higher in MIC and LIC. Further analysis and using information gathered from the interviews a list was composed of topics of interest for future research that can be found in the report.

It is still too early to determine if **COVID-19 has resulted in any permanent behavioural changes** with respect to active transport although there is a growing body of documentation. Short-distance travel has become more widespread due to government lockdown restrictions and home working indicating that travel behaviour changed significantly during the pandemic. More people are cycling, walking locally and, in many cases, not making their daily commutes to their place of work. In addition, they are less likely to visit town and city centres as frequently, and when they do personal space has become more important. As a result of these changes, many city governments have awakened to the importance and value of active transport modes as part of local resilience and for citizens' physical and mental well-being. Temporary "pop-up" interventions, such as bike lanes, parklets and wider sidewalks have been introduced in some places as measures to accommodate the need for social distancing, while plans for implementing cycling and walking measures have also been accelerated.

For decades, the transport sector's approach to planning and investing in the future has been based on a forecast-led "predict-and-provide" planning paradigm. This approach involves efforts to anticipate the future demand for travel (usually focused on motorised road or rail modes), based on data collection processes that either under count or do not include short distance trips. This evidence base is then used to plan the system and make investments that ensure there is the capacity (supply) to serve the predicted increased demand. This approach clearly overlooks the needs of active transport users and does not promote active transport modes.

Over the years the dominance of predict-and-provide transport planning has led to a lack of in-depth, quantitative and qualitative studies of active travel/mobility behaviours and needs for walking and cycling. This is reflected by the lack of recognition of active transport as transport modes. This may be slowly changing in some regions, with the HIC countries leading, and there is also a noticeable and mounting level of discontent with the predict and provide approach within the transport planning community, in line with many countries setting ambitious targets to reduce their reliance on carbon and reducing fossil fuel use. Research has a strong role to play in helping to provide the evidence to change this planning paradigm.

This study was undertaken to **help identify gaps and entry points where research can be used to increase the interest in active transport modes as part of a shift towards more sustainable mobility** and provide inputs to the development of an upcoming VREF call for proposals. Evidence-based and applied research can provide alternatives to current dominant planning approaches and increase the visibility and highlight the strategic importance of active transport. This in turn helps to accelerate the adoption of sustainable, low-carbon transport by promoting active transport modes. The results of this background paper can help VREF to **frame the scope of a new research programme** and ensure that it is both future looking and appropriate for a world that is quite different from the context some ten years ago when FUT was established.

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Introduction

This report reviews the **current state of international research and knowledge on active transport and was undertaken to identify gaps** in this area of research and support the preparation of the Volvo Research and Education Foundations (VREF) Future Urban Transport research programme (FUT 3.0). The study was performed at the beginning of the COVID-19 pandemic[8] and this should be taken into consideration when reading the recommendations and conclusions.

VREF research is intended **to inform and contribute to the global research agenda on sustainable transport**. Its programmes are aligned with international policy agendas, including the Agenda 2030 Sustainable Development Goals. The VREF programme combines support for both research with education. Based on identified research gaps, suggestions have been put forward in the conclusions regarding further possible research areas of interest related to the role of active transport in the post COVID recovery.

The results provide **insights into the current state of research and implementation related to active (urban) transport** and highlights differences, as well as commonalities, between high-, middle- and low-income countries.

The paper is structured as follows. Section 1 establishes the context, the methods used in the study and the scope of current understanding of the term active transport, and other associated terms. The results from the review of published work and the survey findings are also briefly outlined. This section also highlights the key similarities and differences in current cycling and walking research. Section 2 presents the state of play in current research, gives regional overviews and outlines opportunities for change. Suggestions are made based on findings from the review of published work as well as the survey and interviews for future research needs and priorities. Section 3 seeks to identify "who is funding what" and key players. The impact of the recent pandemic on active transport is also briefly explored, with a view to identifying research gaps that VREF may consider addressing in Section 4. It also positions the findings within an international context. Section 5 concludes with research gaps and capacity needs and suggesting possible entry points where VREF could play a role in stimulating future research including education and the training of potential future experts in this field.

Section 1: Scope and context

1.1 Setting the context

Active transport is a relatively new term but one that has been gaining support over the past decade as an alternative to "non-motorised transport" (NMT). Walking and cycling are considered to be the main transport modes within the active transport cluster. In the survey, no definition was provided for active transport (to remain mode neutral). However, suggestions were made in some questions (especially on walking, cycling and micro mobility). The answers given suggested the respondents were more involved and interested in local passenger transport, rather than national, but local urban freight deliveries were also referred to.

Efforts were made to further the discussion on the use of active transport and NMT as terms, and if they could be interchanged and used equally. Additionally, the study included discussion on whether active transport or NMT should include new alternative modes (micro mobility or small intermediate vehicles with motors such as small electric vehicles including E scooters, pedal and electric bikes, and hover boards), as well as bike- and car-sharing options and other light vehicles.

[8] Between January and May 2020

1.2 Methodology

The approach included a rapid literature review of academic and grey literature, a 15-question Internet survey, seven semi-structured interviews, and a peer-review process with a reference group of key actors and experts active in the areas covered by active transport. A link to the survey was circulated to a list of over 100 names of practitioners, researchers and other active transport experts via email and it was also promoted via Twitter and Linked-In. The recipients of the direct email invitations were sourced from an initial review of key players, existing networks and professional groupings, complemented by the researcher's own network and suggestions and recommendations from independent sources. Care was taken to ensure that there was a geographical balance amongst respondents to capture the perspectives of the Global North and South and respect a gender (male/female) balance. Respondents were drawn from all geographical areas and high-, middle- and low-income countries. Efforts were also made to include different communities of interest and profiles beyond research, including the public and private sectors and practitioners. Most of the questions in the survey allowed respondents to add individual comments, and a large number of comments were received.

1.3 Key findings and review of the general state-of-play in active transport

1.3.1 A rapid review of published works

A rapid review of published work on active transport was performed to establish the depth and breadth of international study of active transport and to identify key research gaps. Conventional literature reviews identify published works to answer a specific research question to indicate the state of knowledge; and/or identify frequently cited, seminal works. In the case of this study, the review looked to examine the depth of knowledge on a topic rather than a research question which added complications. As the author had not previously written on the subject, the selection of papers was neutral and came from numerous journals and publications identified through various channels, including academic databases, individual peer review journal archives, institutional websites, and Internet search engines, as well as some non-academic sources. Only English language publicly available papers focussing on the urban context were considered in the end. This is because, as the review disclosed, most transport journals are published in English. An attempt was made to find relevant literature published in other languages (such as French, Spanish or other languages relevant to non-English-speaking geographies) but this proved to be difficult and time consuming.

The literature search was undertaken between March and May 2020, using Internet search engines (such as Google Scholar), the Transport Research International Documentation (TRID) database, and key peer-reviewed journals (including journals published by Elsevier, Sage, and Oxford Academic). The following keywords were used (*inter alia*): urban, non-motorised, active transport/travel/ transportation, walking, cycling, biking and pedestrian and combinations such as walking plus children/ seniors/ women etc., for the period 2015-2020. Since 2015 over 28,000,000 papers have been published identified with the keywords urban, active transport and active transportation. It should be noted that this result included references in which active transport is used as a medical term, on the other hand the term non-motorised transport is only used in transport publications, while non-motorised transport only picks up transport related works.

The literature review showed that this topic has been highly researched over the past decade. The results indicate that there is an extensive volume of publications on the various modes that can be considered part of active transport: walking, cycling (all forms), and to some extent public transport within the various urban contexts. Indeed, using all keywords produces several hundreds of thousands of references, including publications addressing many different aspects of active transport,[9] non-motorised transport, walking,

[9] It should be noted that the results of using this phrase was hampered by it being widely used in medical terminology which resulted in a large number of non transport related papers being referenced in the internet search.

cycling, electric bikes, bike sharing and micro mobility. Road safety also featured highly. Using the Transportation Research International Documentation database (TRID, one of the largest on-line bibliographic databases of transportation research), the keywords "active transportation" alone generated 10,700 records of publications dating back just five years. Papers covering various aspects of the topic were also found in the many journals that publish research on cities, sustainable development, urban planning, safety, health and physical activity.

Literature review	# of hits	Keywords used
Total	28,600,000	2015 – 2020, (all)
Children	13,000,000	2015 – 2020, walking children urban
Youth	11.200.000 6,600,000	2015 – 2020, active transportation youth 2015 – 2020, active transportation youth urban
Seniors	12,000,000	active transportation elderly urban
Women	10,000,000	2015 – 2020, walking women urban Including elderly references)
Road Safety	14,200,000 320,000	2015 – 2020, walking road safety 2015 – 2020, walking pedestrian road safety
Road safety cycling	3,320,000	2015 – 2020 cycling road safety

Table 1: Overview of literature-review results

Active-transport publications included studies on other human-powered transport modes, such as pedal rickshaws. A few special editions of journals have been dedicated to either walking or cycling or both (such as Taylor Francis Transport Reviews, Volume 40, 2020 and Volume 36, 2015) and these were noted. Major transport and health journals, as well as conference publications (such as the annual Velo City and Walk21 conferences), reports and guidance were included in the review. The review also highlighted the large number of tools and guidance documentation that are available, as well as dedicated forums (both domestic and international) where these modes are discussed, and knowledge generated.

The terms walking and cycling are linked together in many studies and documents. Typically, cycling is considered as a sport, a mode of transport and a leisure activity in the Global North, with papers covering all three of these aspects. We found that more publications advocated cycling, rather than walking, as a transport mode. Walking is also considered to be a sport, a leisure pursuit and lifestyle choice but more rarely a transport mode. Many aspects of insecurity for both modes were highlighted especially in papers from the Global South.

There are also indications that both cycling and walking (and active transport generally) are less well covered in the Global South (especially in colonial Africa), and even less in urban, compared to rural, areas. The author suggests that this may be due (at least in part) to a combination of negative connotations. Walking and cycling in Africa[10] are still associated with poverty. Social norms and strong gendered constraints related to culture and religion also restrict cycling resulting in women and girls walking more than cycling. On the other hand, there appears a growing interest in cycling in Latin America.[11]

In the Global South, walking is rarely perceived as a desirable transport mode. While walking and cycling are more often "modes of choice" for those living in high-income countries, it is clear from the literature that people walk out of necessity in low-income countries and walking distances of 5-15 km on a daily basis is not unusual. Men walk longer distances especially for work while women make frequent shorter trips fulfilling

[10] In many colonial African countries' men working in domestic positions (cook, house or garden boy) were provided with a bicycle as part of their salary.
11 51,400 hits were found in Google Scholar for 2015-2020 using the key words Cycling, Latin America, Urban.

their care roles and stay closer to the home. It is well documented that this behaviour is replicated when they shift to motorised trips. Despite recognised differences between walking and cycling, they are most often considered together as short-distance transport choices, or as first- and last-mile connections for longer trips. Based on this observation, there are possible research gaps in terms of increasing knowledge about how either or both can be better integrated into national and local transport master plans, policies and investment decisions (see next sub section).

Few authors stand out in regional or multi-country contexts. Many of the authors that are cited most frequently (such as John Pucher[12] and Ralph Buhler for cycling and Rodney Tolley for walking) have published articles on the impacts (or other aspects) of these modes in the Global North or compared North American and European examples, rather than work from the Global South. Despite a growing number of publications from the Global South, no authors stand out in particular. It is possible that there is a connection between this and the English-language bias of the search (and the keywords used). Nevertheless, compared to the wealth of information being published addressing active transport in the Global North, there is a dearth of published information and citations from researchers in the developing world.

The literature published reflected a stronger research focus from higher-income countries. Further investigation to explore regional differences (using TRID and the other search engines) showed that the greatest number of papers on cycling were published in the USA and (secondly) Canada, followed by Europe.[13] Africa, Asia and Latin America are also well represented. There are also large number of articles from China, India, Sub Saharan Africa, Southeast Asia and the Middle East North Africa (MENA) region, but they were also quite contextual, treating a limited research question. Overall, fewer papers were found from Africa, Asia (excluding China and India) and from middle-income countries (especially Central and Eastern Europe). It was also observed that the papers identified from China tended to be highly technical or narrowly focussed. There is also a large body of work on the equity aspects of active-transport modes (especially from India, Bangladesh, Indonesia and Pakistan). Over 250,000 hits were found using the keywords walking (or cycling) with low income, and the results did not change significantly when combined with other search parameters.

No significant difference was observed in the number of female or male researchers publishing. This may warrant further investigation, as interviewees commented that young female researchers are often given fewer opportunities than males (this was mentioned more often in reference to the Global South). A short investigation of published literature showed some evidence of this being true for all sectors, not only in transport. For example, Morley[14] who looked at higher education in five countries, states that gender discrimination exists broadly in the research community. He found that a range of discriminatory practices, gendered processes and exclusions within higher education were quite common. These include the exclusion of women from career development opportunities, gender-insensitive pedagogical processes, prejudices about women's academic abilities and intellectual authority, as well as poor gender-equality policy implementation within institutions. Several other authors note that much of this type of discrimination is covert, intangible and abstract.

1.3.2 Level of scholarship and interest in walking and cycling

The main findings from this review are that there is a **high level of scholarship in active transport**. However, the research tends to be context specific and not scalable (i.e., the research scope is often on a topic such as safety or restricted to a geographical area such as a town, city or selected areas within these which limits its applicability). From the lack of investment and infrastructure on the ground, research findings do not seem

[12] Examples of the level of citations from these authors are given in the annexes.
[13] Wider Europe i.e. 28 countries
[14] Morley L., (2006) Hidden transcripts: The micropolitics of gender in Commonwealth universities, Women's Studies International Forum

to have been widely transposed into policy or projects. It was not possible to determine how many research papers have been published on the topic[15], or to review many of the papers identified due to the sheer numbers of published articles (see Table 1) but it was observed that there are **more technical papers on cycling than walking within the transport journals.** This is further reflected in policy documents, where cycling is regarded as a transport mode[16] while walking is not. These findings were validated by the results of the survey and the interviews.

Walking featured more widely than cycling in health or combined journals. Examples include Health Promotion International and Transport and Health, with fewer published in journals dedicated to transport. Both modes also feature strongly in international publications outside of the transport sector, such as those by the World Health Organisation (WHO) which publishes guidance on physical activity highlighting the health benefits of walking and cycling.

In May 2004, the Fifty-seventh World Health Assembly endorsed Resolution WHA57.17: *Global Strategy on Diet, Physical Activity and Health* and recommended that WHO Member States develop national physical activity action plans and policies to increase physical activity levels in their populations. This was further endorsed in 2008 and the Action Plan for the Global Strategy, which urges WHO Member States to implement national guidelines on physical activity for health and encourages them to develop and put into practice policies and interventions that:

- Develop and implement national guidelines on physical activity for health;
- Introduce transport policies that promote active and safe methods of travelling to and from schools and workplaces, such as walking or cycling; and
- Ensure that physical environments support safe active commuting, and create space for recreational activity.

Box 1: Example of the promotion of active transport from outside the transport sector

The **most researched topic was on the combination of active transport with road safety** (usually exploring the negative impacts), followed by health (with the positive physical benefits being more studied than mental aspects).[17] The highest number of hits (2015 - 2020) was obtained using the keywords “vulnerable road users” (see Table 1). It should be noted that these results also included a number of non-transport related papers, as these were difficult to exclude through keyword selection.

There are numerous tools, guidance, programmes and design documents that promote different aspects of active transport, as well as a growing number of audit tools and apps. These are published by a variety of organisations, such as National Association of City Transportation Officials (NACTO), Institute for Transportation and Development (ITDP), Walk21 International Charter for Walking, Sidewalks Challenge, WHO’s Health Economic Assessment Tool (HEAT), Share the Road (UNEP and FIA Foundation), and The Global Walkability Index.[18] The US Transportation Research Board Pedestrian/Cycling Committees looks to further research on these topics. In addition, there are many forums and professional associations. Examples include the European Cycling Federation, World Bicycle Forum, World Bicycle Relief, WHO Pan European Partnership (PEP), International Pedestrian Federation, America/Victoria Walks (Australia), etc. that consolidate expert knowledge, and their members publish on the subject. Yet, few of the tools that are available for either walking and cycling were mentioned in the survey and interview responses (apart from a

[15] Due in part to the issue of medical papers appearing under active transport.
[16] See recent example from London ‘A gear change for cycling and walking’.
[17] Investigating the mental health benefits of active transport is more developed in the health domain than in transport. The recent pandemic has highlighted the need to non-medical interventions to help address mental health issue indicating a possible avenue of cross discipline research interest.
[18] Krambeck H., Thesis (M.C.P.), Massachusetts Institute of Technology, Dept. of Urban Studies and Planning; and, Thesis (S.M.)--Massachusetts Institute of Technology, Dept. of Civil and Environmental Engineering, 2006.

handful of spontaneous mentions in the interviews). This is somewhat surprising considering the number of tools available and the recent explosion in relevant mobile phone apps.

Furthermore, the majority of the platforms and forums identified tend to address **either walking or cycling.** Some combined either mode with one other aspect (such as road safety or health), but few looked to support active transport as a cluster. Cycle tourism (covering increasingly larger regional multi-country zones) is also quite widely studied as a separate issue, but these works predominantly focus on Europe or North America. Long-distance walking for leisure or tourism was not directly analysed in this study. This single focus was also observed in most research papers, with fewer studying cross-disciplinary or combined aspects, or non-modal-specific aspects of active transport (poverty reduction, equity, climate change, etc.).

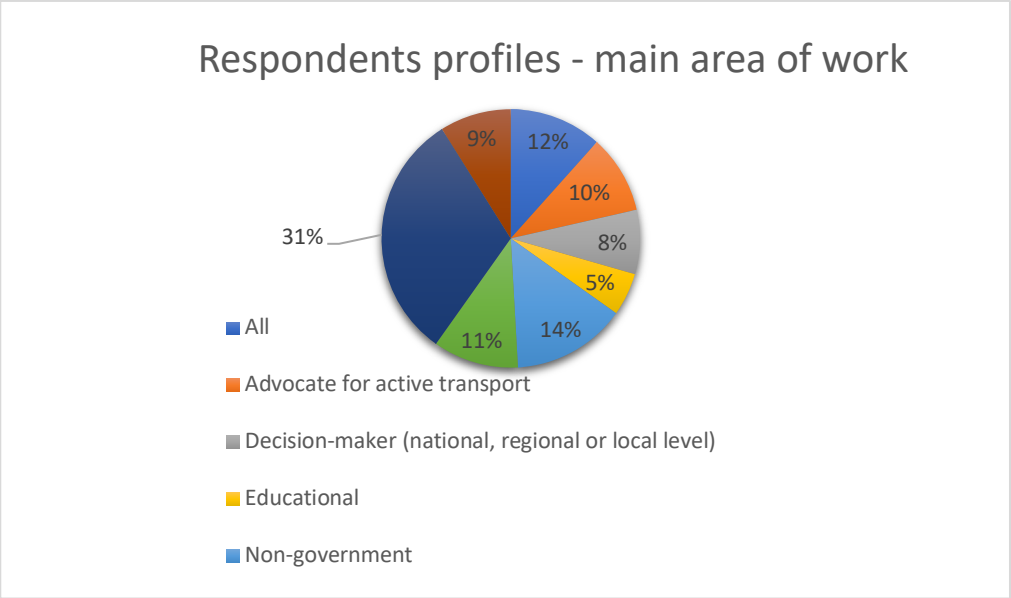
Many research papers highlight the **major differences between walking and cycling.** Despite this being recognised, in most reports and documents on implementation and policy **these modes are still often bundled together.** In policy documents, walking is often mentioned in the text as being 'of importance' but cycling is given more attention and there are more examples of stand-alone strategies for cycling than walking. Most policy documents refer to both modes and focus predominately on local interventions, with only a few addressing regional or national issues. It appears that cycling gets the lion's share of attention in terms of strategies and investments. The recent publication (2020) by the UK Department of Transport – A gear change for cycling and walking – provides an example.[19] In all three main sections including the one guidance as indicated on the contents page, almost *all* attention in the text refers to cycling and little reference is made to walking. Local actions and policies for promoting cycling and/or walking are quite therefore widespread, but there are noticeable **gaps in policy documentation at higher, strategic levels**. Additionally, there are fewer regional or national walking strategies compared to cycling. Some examples were found, such as Rotterdam Walks 2025 (November 2020) and Let's get Scotland walking (2019). Regional examples can be found especially from North America. California stands out in the lead compared to other states and has a history of both separate and combined plans for pedestrians and cycling. Some Active Transportation Master Plans have now been adopted at county jurisdictional and individual city levels.

There has been a **noticeable increase** in all categories of publications (academic, policy and implementation levels) concerning active transport over the past five years with the majority being published in the Global North (Europe or North America). A growing number come from Latin America (especially Colombia and Mexico) but this appears to be increasing year on year. However, while active modes are now mentioned more often in national/regional sustainable transport strategies[20] and master plans, few have identified measures, actions and funding that specifically encourage their development or provide financial support to active transport modes.

[19] A gear change for cycling and walking - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904146/gear-change-a-bold-vision-for-cycling-and-walking.pdf

[20] With the support from agencies and NGOs such as UNEP, IDTP, several African cities have now NMT/Walking strategies. This is a relatively new development. Research will be needed to keep these programmes going and the local politicians need also to remain motivated beyond the life of the project.

1.3.3. Survey findings



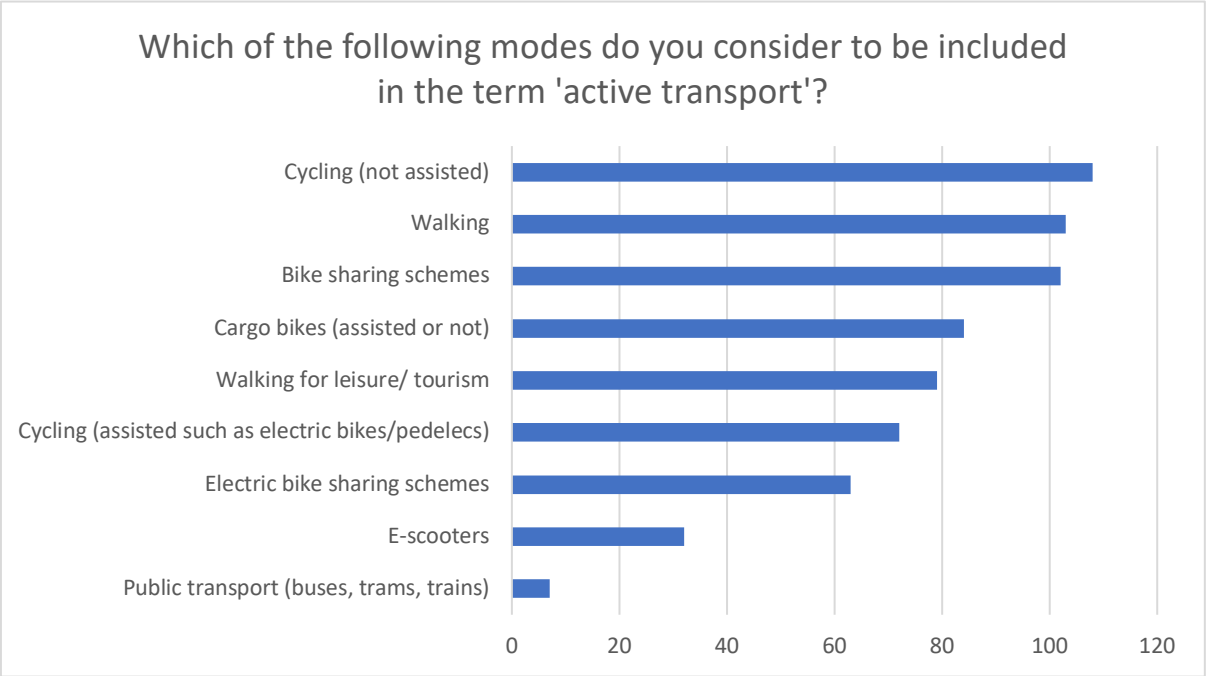
Graphic 1: Respondents' professional profiles
("All" indicates that multiple categories are applicable)

A total of **112 cleaned responses** were obtained from the survey with a relatively good representation from high-, middle- and low-income countries, as well as from those who brought an international perspective (see Table 2). **Most respondents worked across a broad range of areas connected to the topic with around a third working on more than one aspect** (see graphic 1). There was a good gender balance of the respondents (52 female and 50 male responses plus 10 who preferred not to answer). The survey allowed respondents to make comments and those of particular interest have been included in this report.

Regional perspective	
Global North	30
Global South	39
Both (international perspective)	40
TOTAL	109

Table 2: Responses to the perspective taken to answer the survey

Most respondents felt that they understood the term active transport. From the 110 responses to this question, 58% answered that they understood the term very well, 23.5% quite well, 13% answered that they had a general understanding. Only 5.5% responded that they did not understand the term well and a single respondent indicated having heard the term being used but did not really understand what it meant.



Graphic 2: Respondents' views regarding which modes should be included in the term active transport

There was unanimous consensus that **walking and cycling form the backbone of active transport modes**. Walking received slightly fewer votes than cycling (not assisted) and this may be because walking is not broadly recognised as a mode of transport. Overall, respondents agreed that the modes suggested in the survey reflected all the modes that can be considered to be active modes. From the comments, hand carts and cycle rickshaws (of particular importance in some countries in the developing world) were suggested as additions. The majority of respondents also indicated that public transport should be included (as the access and egress from it required at least one active mode) but not everyone agreed on this, and there was some level of support for including newer modes, such as kick scooters and skateboards based on comments (see below). Very few respondents included negative comments about including e-scooters as part of active transport, which the author found somewhat surprising as there have been a number of recent reports on whether or not they can be considered to be active.[21] Notably, a few respondents added tourism (e.g., distance cycling), jogging and skateboarding, while others proposed that the definition of active travel/transport should include 'transport modes that have a destination'[22].

Comments of particular interest:

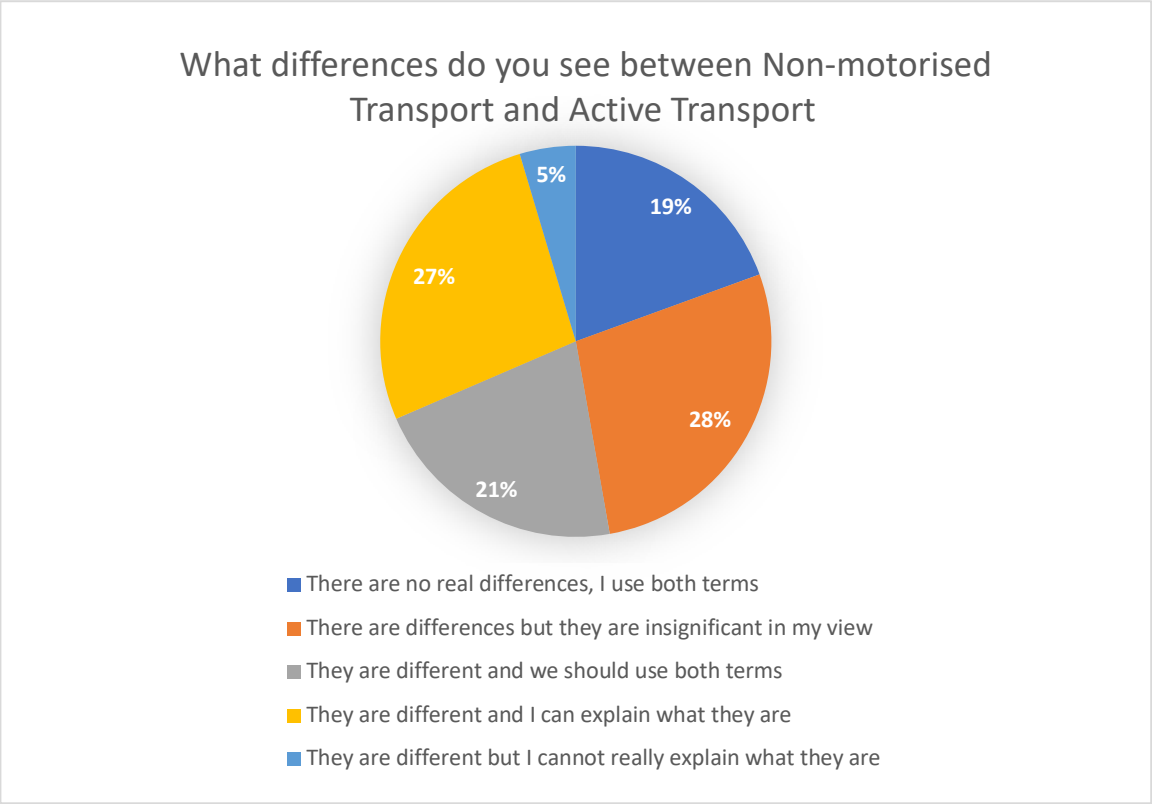
- Hand carts, rickshaws, kick scooters, skateboards, and 'toktok'[23] and cargo bikes can be included.
- Public transport involves an aspect of active transport, especially during the first and last mile and when people interchange between routes and modes.
- Car sharing could be included, as it should be seamlessly connected to other modes and services within the whole system and requires walking or cycling to the pick-up area. The same holds for e-scooters.
- Using an assisted bicycle can be considered as active transport, as there are times when the rider needs to pedal.

[21] Such as https://www.sustrans.org.uk/our-blog/policy-positions/all/all/our-position-on-e-scooters#:~:text=Modal%20shift%20and%20active%20travel&text=However%2C%20e%2Dscooters%20offer%20no,scooters%20or%20by%20public%20transport.; https://www.bicyclenetwork.com.au/tips-resources/bike-friendly-communities/new-reverse-traffic-pyramid/; https://www.portlandoregon.gov/transportation/article/709719 ; https://revolve.media/micro-mobility-challenges-and-opportunities-for-cities-regions/

[22] See earlier comment about active mobility versus active transport

[23] A toktok is a two-wheeled pulled rickshaw, common in Asia, when a person draws a cart with a seat for one or two people.

One question in the survey explored **the relationship between active transport and non-motorised transport (NMT)**. This was designed to determine perceived differences between them, the extent to which respondents preferred or felt more (or less) comfortable using one or the other and how respondents perceived the interchangeability of the terms. The results were inconclusive. 48% of respondents indicated that **the terms mean different things**, i.e., they should *not* be used synonymously. An almost equal amount (47%) indicated that **there are insignificant or no differences**, i.e., the terms can be interchanged. The remaining 5% recognised that there are differences between the terms but were not specific about what those differences are.



Graphic 3: Chart showing respondents' perception of differences between the terms active transport and non-motorised transport

On the other hand, the comments and responses from individuals in the interviews indicate that there remain **strong and polarised views** on which is the best term to use, and no consensus could be drawn. A variety of reasons were put forward. For some respondents, the term active transport linked it to activities that are strongly tied to health or sport (citing long distance cycling/ racing, countryside walking (rambling)) rather than to transport. Most of these respondents were more comfortable using the term non-motorised transport, while others strongly opposed this because they felt that the term uses "motorised" as a reference point. For them this implies that being motorised is more advanced, or developed, suggesting that walking and cycling are somehow associated to poverty and a lack of development, and giving them lower importance as transport modes. There were also several respondents who disliked both terms and proposed "walking and cycling (for transport)". However, they also recognised that this excludes many of the new mobility options. Yet another group felt strongly that assisted modes (such as electric bikes), light vehicles and shared modes are not part of active transport. It should be noted that the term non-motorised transport in the literature search picked up only papers that concerned transport, compared to using active transport which also identified some medical papers.

Comments of particular interest:

- Non-motorised means without a motor (combustion or electric) but active can include vehicles that are motorised, but where people (partly) use their body for a transport purpose.
- Active transport sounds more positive than non-motorised transport. Identifying it as a mode of transport that does not need to be related to anything else. The word 'active' also emphasises that it is healthy.
- Both terms do not match the needs fully. A "non" term is not good, but "active transport" should not include motorised options. In either case, the assisted ways of moving should not be included, but they are often. We need another term which is easy and includes further dimensions. "Ecomobility" is a term which can be used in this way.
- Non-motorised transport should definitely not be used for walking and cycling as it defines both modes in terms of a deficit instead of promoting their strengths.

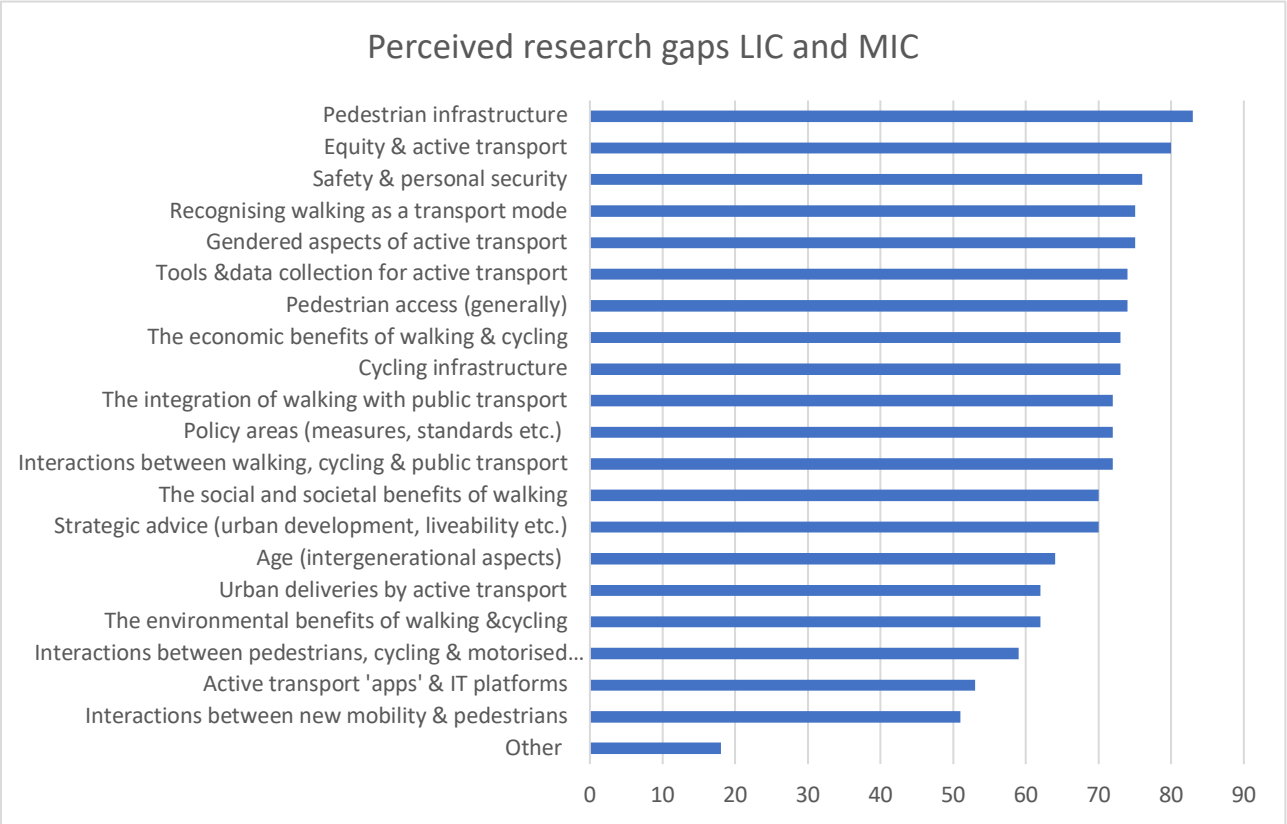
The interview responses indicated that the terms active travel or active mobility can add to the confusion, rather than help to clarify the terminology. In some academic research, these terms are used interchangeably and are linked to mobility performance (see glossary) but they are not widely used. Active travel seems to be a preferred term in the UK and Europe, but it does not hold its meaning in the US or Africa. Understanding the differentiation between travel, transport and traffic may be relevant for academic research (as each operates in different markets, influencing specific types of demand and supply decisions) but these differences may be of less importance to practitioners.

Section 2: Regional variations and opportunities for change

2.1 Regional overview

The study showed up some clear differences between the main geographical regions. This can be further separated by income, with the Global North representing higher income countries and the Global South mid and lower incomes countries. Based on comments in the survey and the numbers of papers published on this topic from middle-income countries, the author concluded for the purposes of this study that these regions are similar to low-income countries and there were not enough differences to consider them separately.

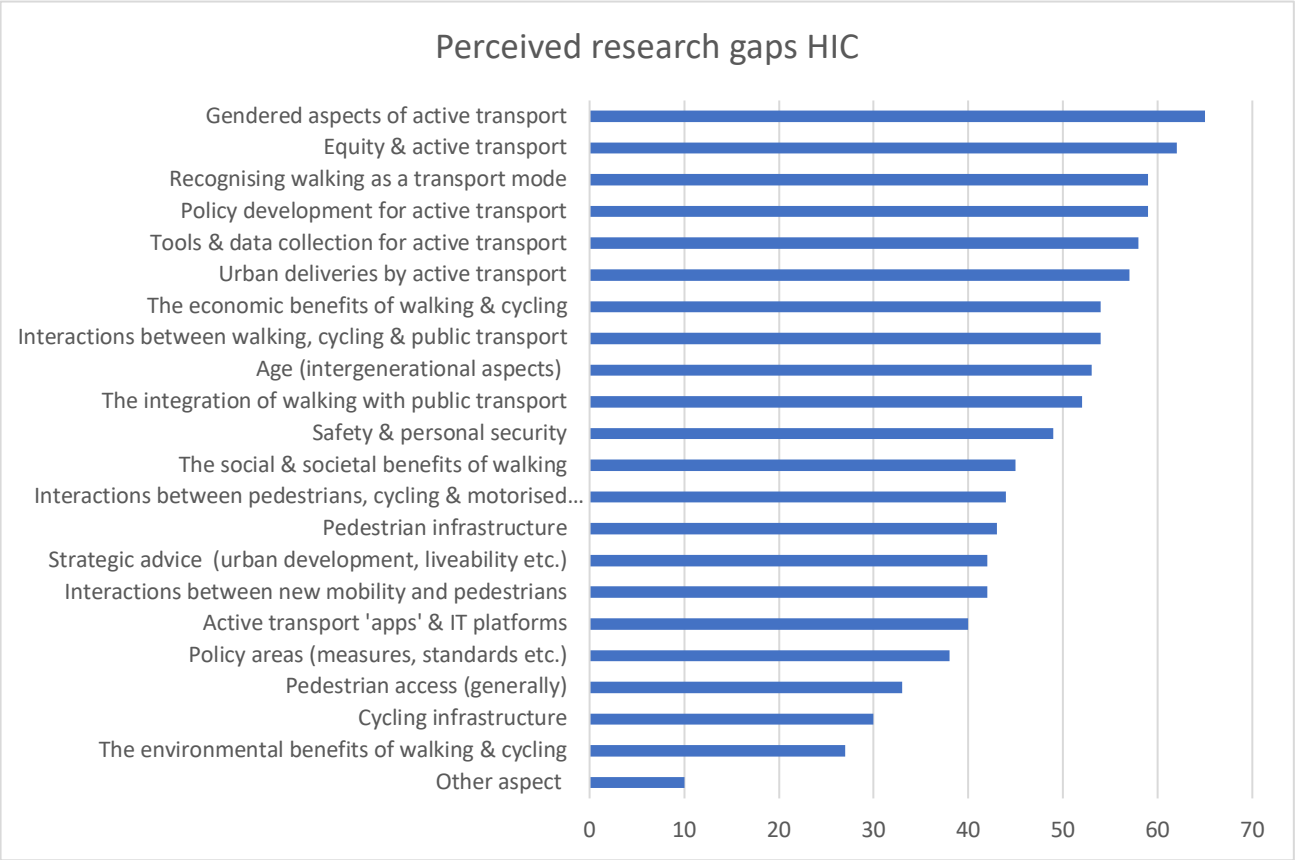
The survey results showed little difference between the regions in the topics of the perceived research gaps, but some variations in the ranking. Most respondents indicated that research on almost all of the suggested topics would be of interest for both MIC and LICs, while HIC identified slightly different priorities. Pedestrian infrastructure and equity were the top two choices for the two regions (LIC and MIC) and technology solutions such as apps were near the bottom. New mobility options were selected the least often, and this differed from the respondents' choices for the Global North, where they were ranked highly.



Graphic 4: Perceived research gaps in low and middle-income countries, by topic
(Respondents were invited to choose all topics where they felt there are gaps)

Specific comments from the survey included:

- All topics are poorly developed in LIC regions. However, car ownership is still the lowest in the world. Walking is the highest. Both of these are positives. This means improving infrastructure for NMT and celebrating NMT should be the most important considerations.
- All are ticked because they are all important - additional research needed with the evolution & emergence of technology-enabled 'new mobility' networks, systems & business models and with internet-enabled global information exchange.
- Essentially more research in all of these areas is needed in the Global South. Most transport infra projects are only those that are capital intensive, e.g., roads, mass transport, etc. but very little on NMT/ active transport.
- Lack of research in low-income countries is across the board, on all topics, because of the lack of research funding & research institutions are unable to publish their work in journals.
- Financing mechanisms for active transport is missing.
- In my view, these are less gaps in the research, but gaps in the implementation and acceptability.
- Active mobility as a key tool for sustainable urban development, including social dimensions, and the relationship with informal transports (this is probably more applicable in LIC).
- Active transport for school journeys (would help education).
- Interaction between motorcycle taxis and active transport.



Graphic 5: Perceived research gaps in high-income countries by topic
(Respondents were invited choose all topics where they felt there are gaps)

The survey responses showed that the research landscape is more mature in HICs. This is reflected in a more nuanced set of identified research gaps (see graphic 5). Tools and data collection were rated highly, and this was also highlighted in many of the interviews. Nonetheless, there was also a high level of interest in research on the equity and gender aspects of active transport. The author suggests that this may be a result of attention to the gendered impacts of both COVID-19 and the pandemic's impact on transport, as well as more generalised increase interest in inclusive transport and gender issues at national and local levels. There were also a large number of comments in respect to the current state of play of active transport research in HIC.

As indicated in the literature review, there are also notable gaps in multi-, trans- discipline[24] and multi-criteria studies of active transport. While the intersection of active transport with other modes is quite well covered, intersections with other subjects – such as economic and social aspects, or quality of urban life – are not.

Specific comments with respect to high-income countries:

- A lot of research has been done in HIC countries though there are still visible gaps for example between North America and Europe, and the high status of automobile ownership is still an issue.
- There is a real lack of counting walking. There are bike counters that are installed and referred to but no visible pedestrian counters despite advances in technology.

[24] Trans discipline was added here. Transdisciplinary Research is defined as research efforts conducted by investigators from different disciplines working jointly to create new conceptual, theoretical, methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address a common problem.

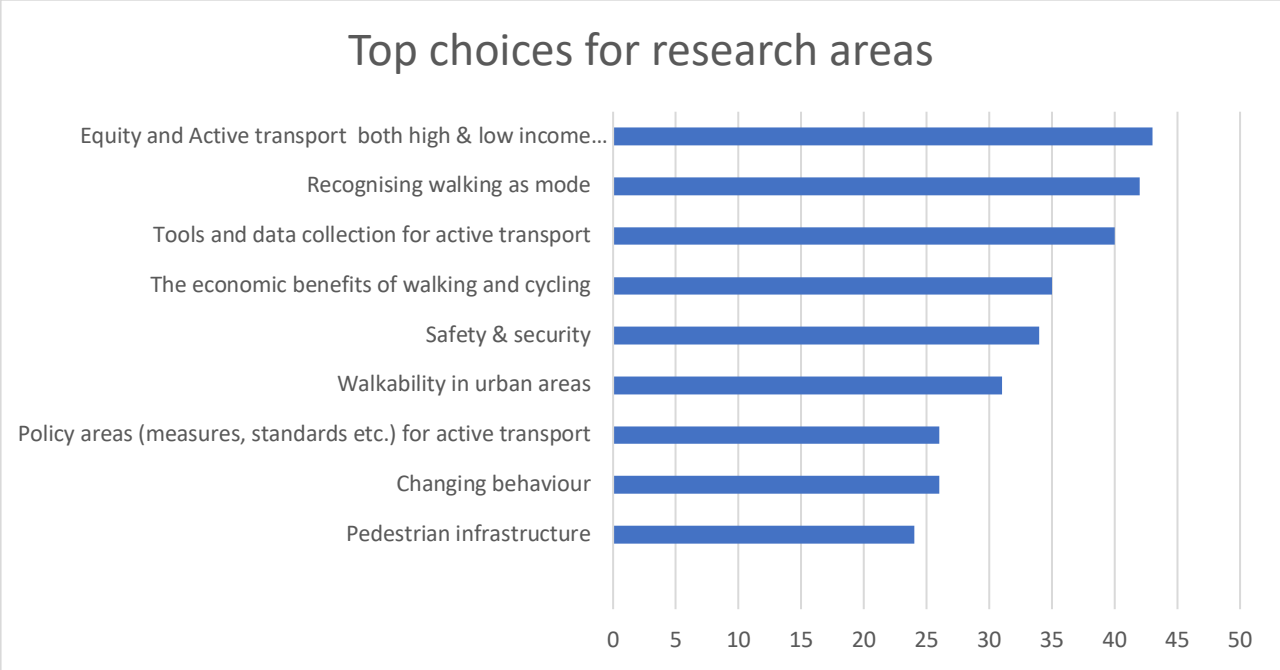
- Many capacity gaps in active transport.
- Even though there is some good research, we do not have enough policy and investment in walking, (research conducted has not hit the mark). Also feel that a lot of academic research is not of great use for advocates.
- Priority areas are the interactions between new mobility and pedestrians (particularly vulnerable walkers); gendered aspects of active transport (little sex disaggregated data collected at this level); and strategic advice on active transport (urban development, liveability etc.).
- The economic benefits of active mobility, especially jobs. We need arguments to counter the automobile industry interests and strategies of transforming this sector into one offering different products and services.
- Lack of data, scarce knowledge about social/societal aspects/benefits and equity. We know in principle what should be done but we don't understand why the good solutions aren't implemented and what should/could be done to overcome the problem.
- Social justice and integration, from gender, disability, and disadvantaged sector perspectives particularly, in many countries, race and income group.
- Best practices in fostering active modes for school trips (and learning of how to walk for children and teenagers) and work commuting.
- Tools for more comprehensive evaluation of active transport, to help practitioners justify more support for active modes in transport policy and planning.
- Recognition of active modes in CBA/economic analysis, as well as in strategic transport models.
- Impact of land use planning and active transport modes.
- Overcoming inertia and path dependence when developing new transport policies and instruments.
- Living labs to let people experience new options for moving and urban space.
- The challenge of including cycling and walking fully on the MaaS discussions.
- There definitely needs to be more research about artificial intelligence, digitisation of social inequality and the mobility behavioural shifts that these platforms drive.
- Using active travel as a crisis mitigation measure and the role of it in the post-COVID-19 city is an area of interest.

2.2 Common themes

A number of **common thematic areas** of interest (i.e., perceived research gaps and needs), were identified for future research (see graphic 6). Research on both cycling and walking was **considered by most respondents to be more developed in higher-income** countries. However as can be seen from the choices of most interest for all regions (as shown below), there was actually almost no difference in the choice of topics between regions but there are some **noticeable differences** in their ranking (as indicated in graphics 4 and 5). For example safety and security was ranked much high in the Global South. On the other hand, environmental aspects, interactions with new mobility options, the use of technology and apps were seen to be of higher importance for HIC and although they were still of interest they ranked lower for MIC and LICs.

The topics of equity, gender and active transport ranked the highest for both high, mid and low-income countries and although there were separate questions in the survey, the responses have been bundled together as presented in graphic 6. Data collection was highlighted in the interviews as a key need for all regions. Overall, there was a greater focus on pedestrians by those from LICs and MICs despite this being quite well covered in the literature it was still not felt to be enough, and **research on the intersections of safety and security** were ranked particularly highly for LICs. Interactions between public transport, aspects around an aging population and urban freight had good support from those in HICs but was only ranked sixteenth out of twenty-one in LICs.

However, key area for future research for all regions was **recognising walking as a transport mode** (ranked second for LICs and third for HICs), this was closely followed by **data and tools (including measures and standards), and economic aspects.** Research on safety and security, walkability, policy development, , walkability, changing behaviour and pedestrian infrastructure were also widely supported.



Graphic 6: Perceived research gaps for all regions (HICs, MICs and LICs combined)

The following additional topics from those proposed in the survey were made by respondents:

- Walking and cycling in transport planning – policy and strategic responses.
- Developing innovative finance and business models to drive more investments in active transport.
- Integration in economic evaluation/assessment of infrastructure.
- Potential for mode retention linked to quality infrastructure.
- Institutional responsibilities/integration, regulation etc.
- Health impacts and environmental performance of active transport modes.
- Socio-demographics and choice or captive mode choice.
- Use and design of public space in relation to active transport modes.

2.3 Active transport in education

From the survey responses, the level of education in the developing world (including middle-income countries) on active transport is considered weak. Based on the interviews and the survey findings, the general opinion is that **active transport is neither widely taught nor supported in transport education**. Active transport (and/or walking and cycling) is frequently optional within transport study programmes and is often considered to be a soft, less technical discipline within transport. **The absence of technical capacity with respect to walking and cycling at city and national levels in many emerging economies is likely to be a result of the lack of a robust pipeline of competent and trained young professionals**. Based on observations and the discussions in the interviews, this may also be linked to the experience and professional bias of those teaching transport. They, themselves, may not have been fully exposed to the value of these

modes either professionally or when they were educated and thus these modules are not promoted to students with the same level of vigour and enthusiasm. The following specific comment was made by an interviewee: “Interest in motorisation is seen to be a pathway towards academic achievement”.

A similar view appears to be held by students. Based predominantly on feedback from the interviews of those in the education sector, students perceive that investing in increasing their knowledge and developing expertise in active transport will not result in well-paid, interesting and secure positions following graduation, compared to other transport sub-sectors (rail, motorised, or freight). Additionally, it was observed that those interested in this topic are often themselves keen cyclists or walkers and it is through this personal interest that they have furthered their professional work.

2.4 Moving forward

The results of the literature review and the interviews indicate that some progress has been made on collecting information and data, but this is not equal between walking and cycling. Data on walking as part of transport is seen as being lacking despite wide acceptance that pedestrian data provides vital information to planners, engineers, designers, public health professionals and others working in this field, data on walking appears to be lacking everywhere.

Technology can help but it is not perfect. Managing volume and flows are key aspects of transport planning yet pedestrian counters are less common than cycling counters; and both are underused compared to counting motor vehicles. Automated counters are being used in some places to count active modes, yet many counters cannot distinguish between a person walking, those who are walking accompanied, those walking with a bicycle or those riding a bicycle slowly[25]. Based on remarks in the interviews, automated counter data needs to be interpreted carefully and count methodologies are not standardised. Therefore, not only **how data can be collected (in new cost-efficient ways, possibly with technology) but also its analysis** may be interesting and useful topics for further research.

From the findings of this study, it can be assumed that the **importance of walking in transport is currently largely underestimated,** especially the case in emerging economies. The same is likely to be true, but to a lesser extent for cycling. **Interest in cycling as a transport mode (especially in urban areas) has increased in political, economic, and the general public’s perceptions over the past decade**. On the other hand, walking is still mired in debate regarding its value as a transport mode and suffers from a lack of visibility in both public-policy and investments contexts. This appears to be more pronounced in the developing world.

In part, this may be due to a lack of data, but also likely to be due to the way transport models (particularly cost-benefit analysis) that are widely used to influence investment decisions, undervalue walking. Walking as a means of transport is mostly used for short trips (15 minutes or less) and many national travel surveys (or other surveys) omit to collect such trips. Thus, it is difficult to assess the extent of pedestrian mobility or its relevance if these models are used. In addition, travel surveys often ask for the “primary mode used”. As walking is often part of a longer trip that includes using motorised modes, the motorised trip is usually counted not the pedestrian part. Examples of this practice include the walking sections of a public transport trip, which are also not usually counted. Investigating such aspects of active transport may provide insights that can be used to integrate and mainstream active transport more effectively into transport planning.

These observations are not new and have been noted in much of the research. Planning and investment processes are slowly changing, and data is beginning to be collected in new and innovative ways, but this is not yet mainstream and this needs to be amplified and accelerated. **Building a more robust understanding**

[25] Based on remarks by walking experts.

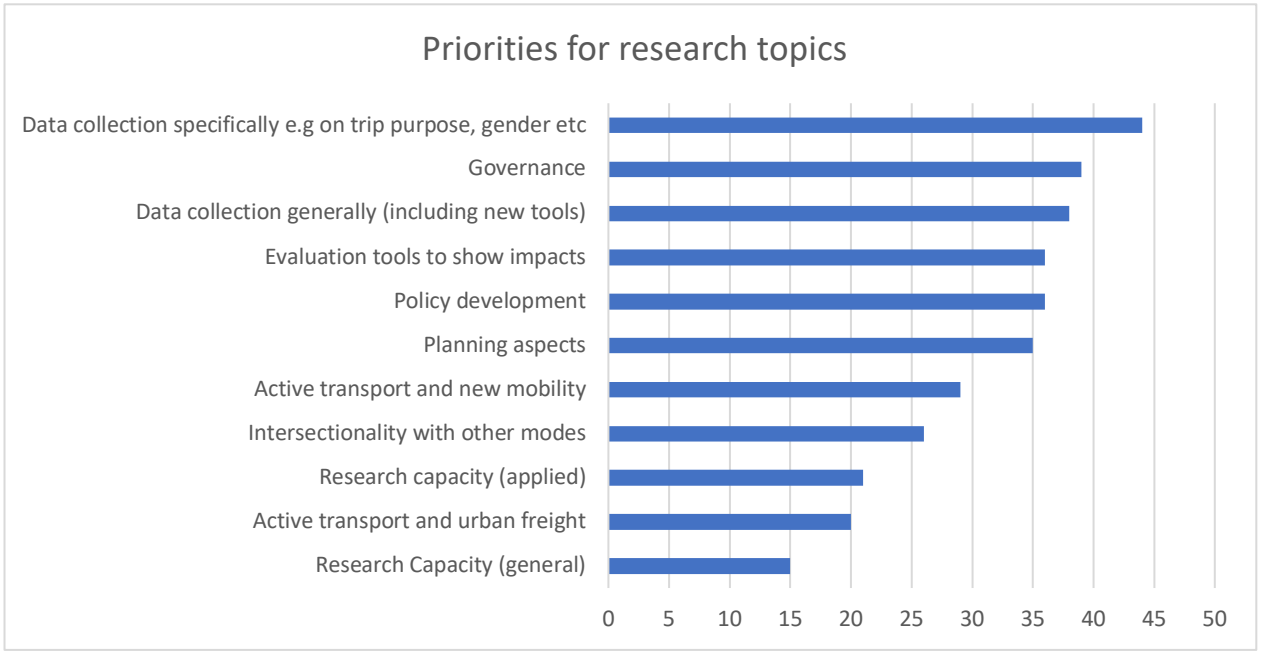
of active modes and their benefits, especially walking, could be a useful addition to the international research agenda, to do this. Additionally, the other identified research gaps such as recognising walking as a transport mode, improving tools, assessing the economic impacts, equity and gender, would all help to build a stronger evidence base for political and financial support for the active modes of walking and cycling.

2.4 Priority areas for further research

To enable the extraction of greater detail from the survey responses, the respondents were asked to rank a predefined list of topics that could be suggested to help define new research topics. This differed from their perceptions of existing research gaps, which were explored in the previous section, although there are some overlaps.

Recurring topics included **data collection (generally and disaggregated by trip purpose and gender), governance issues, and evaluation tools** to show the impacts of active transport. These were seen as the **most important and highest priority areas**. Lack of sufficient data was frequently mentioned as being a major gap (both in the comments and the interviews) and major research challenge. This was more apparent in responses from the Global South. This is not surprising as transport data is generally relatively poor in the Global South, and data collection is frequently project rather than needs driven[26].

From the survey and interviews, respondents mentioned that there were few **tools developed to show the positive impacts of active transport**. This indicates a need for tools that show the benefits of these modes, rather than focusing exclusively on their disadvantages when compared with faster, motorised modes. Such tools would allow active transport to be better positioned as a priority for policy development and/or investments. In reality, there are a number of tools available, but the results of this study indicate that they are not well known and/or may not be easy to access for researchers and practitioners, especially in emerging economies. It is also likely that the tools cannot be fully utilised because the data for these modes is generally poor.



Graphic 7: Respondents' ranking of pre-determined research topics

26 In other words, data is collected to support a particular project rather than to understand the mobility needs of a city or region

There is also an apparent gap between the rhetoric of decision makers in support of active modes (i.e., what they say), and actual resource allocation, investment at national, regional or local levels, and on-the-ground implementation (i.e., what they do). Despite a number of policy documents that stress the importance of active transport modes, and based on the literature review, there is little actual implementation. There were also many comments indicating that much of the research "*while valid has not had much impact*."

Research efforts in many countries in the Global South remain fragmented with much of the research focussing on the problems rather than the solutions and few highlighting good practices, with some Latin American countries being exceptions.[27] In addition, there is also **little evidence of South/South exchanges** of experience or case studies, especially with robust evaluations.

How **walking and cycling intersects with new mobility modes**, policies on allocating urban space between motorised and non-motorised modes, vehicle standards (e.g., speed restrictions for e-bikes) and taxes, and social economic aspects such as equity, gender, age and income are all seen as research areas where there are significant gaps in both regions. These were ranked higher in HICs and are seen to be of particular interest to city authorities in the Global North. Some city forums have developed briefing papers on these topics (e.g., POLIS) outside of the research agenda.

Practical and applied research was perceived as being of interest and comments during the interviews highlighted the need to better prepare a robust pipeline of active transport expertise. There is also space for additional work on defining the scope of the term active transport (transportation, travel or mobility). This might be beneficial to be able to introduce (or re-introduce) it as a new and interesting concept in policy and implementation domains (see suggestions below regarding the negative image and terminology used in the media that influences the general public's opinions).

Based on both the survey responses and the interviews the following additional observations and suggestions were noted:

- Research on equity and active travel as well as COVID-19 impacts on urban mobilities.
- Disaggregated equity and transport research based on demographics; budgetary and public funding schemes (also related to taxation).
- MaaS systems; new mobility innovations, system integration, industry developments & job creation.
- Health and active transport need more attention.
- Include new research strategies, particularly participatory action research (PAR) and action research for transformation (ART).
- More attention in political decision making, engineering standards, and engineering & planning education and increasing government capacity.
- A lot of research exists supporting walking and cycling, but the institutions are set up to build flyovers and expand and pave carriageways, not build sidewalks and bicycle lanes. How can institutions be changed to be able to better support and invest in active travel?
- Development banks and other agencies (such as the African Development Bank) do not recognize the importance of active mobility changing this can help trigger mobility behaviour changes.
- Implementation-related research (policy, governance, data etc.) may have a better leverage effect than 'single' transport issues
- Not 'lumping' walking and cycling together they are different modes with different needs
- Sustainable business models for collective public and active transport.

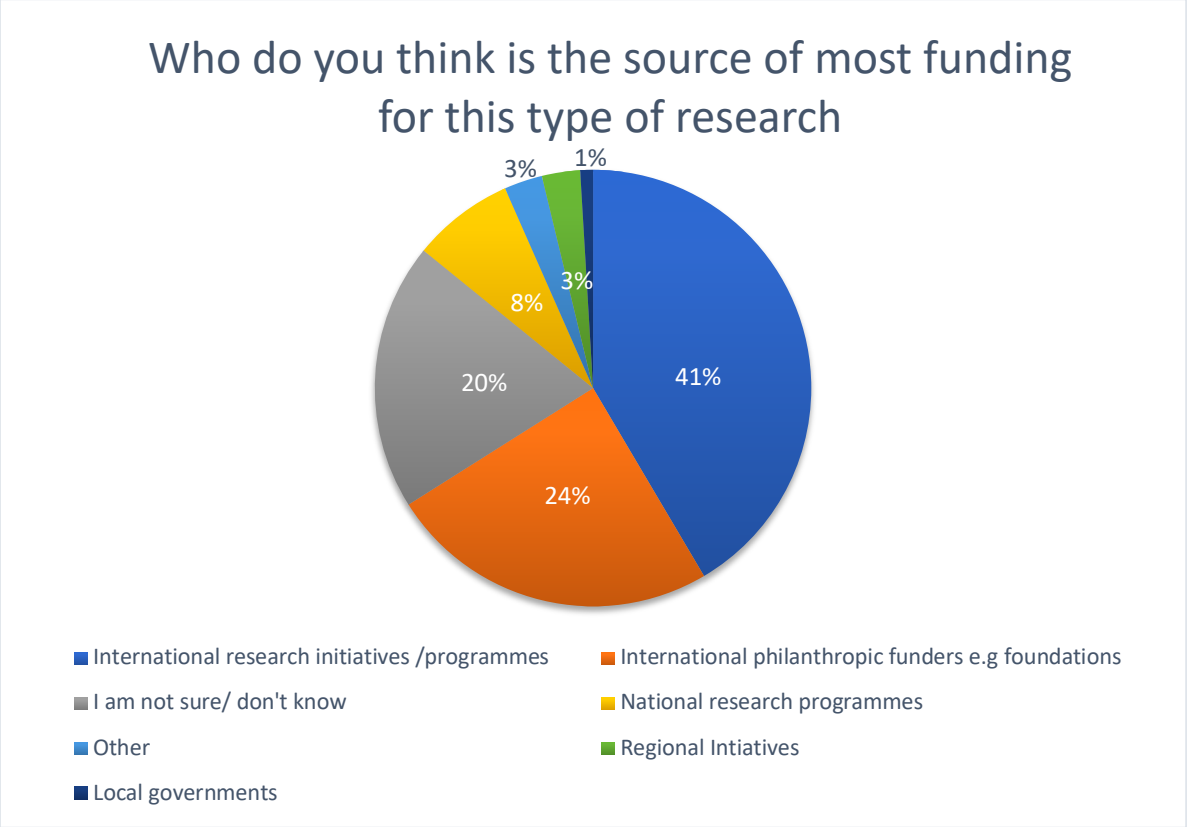
[27] Such as the success of the Cyclovia concept.

VOLVO RESEARCH & EDUCATIONAL FOUNDATIONS

Section 3: Research funding profiles

3.1 Who is currently funding this type of research?

Based on the survey, the clear majority of respondents and interviewees thought that research on active transport is funded mostly through international research initiatives and/or by philanthropic foundations (see graphic 8). Respondents that were unsure came mainly from the developing world, implying that researchers and practitioners in the developing world may be less aware of international research funding sources and programmes. Most funders mentioned are located in the Global North, but several have a focus on investing in research in the Global South. Examples include the UK AID (previously part of the DFID research programme) HVT programme, Millennium Challenge Corporation/US Aid, the European Commission, some national research councils, Walk21 and VREF itself.



Graphic 8: Profiles of those who currently fund this type of research. N=106

Regional, national and local governments were not seen as being the major sources of funding for research on this topic. Indeed, most respondents felt that there was little or no money from national or local governments for active transport research. International funders were perceived to be more likely to support multi-county or regional research rather than national or local studies, highlighting a possible gap. Research programmes supporting active transport were seen as being quite fragmented, and many respondents expressed a desire for improving opportunities in the local context and suggested that funding should be provided by "*national funding in cooperation with local actors, e.g., municipalities and possibly philanthropic foundations. The projects should then include NGOs and experts (researchers, planners, etc.), since they contribute the crucial knowledge. Just providing funding alone - as examples show - sometimes creates more problems than are solved*." However, this reflects the lack of scalable and replication in current published works; one of the key findings from the literature review.

The European Commission stood out as a major funding source in the Global North as it has provided significant funding for active transport research. Their funding model promotes multi-county/city collaborative exchanges (with horizontal rather than vertical integration) and includes both research and implementation. However, most of the Commission's funds go to cycling. The European Cycling Federation (ECF)[28] found that approximately 600 million Euros was allocated to cycling from 2007 to 2013. This was significantly increased in the following research programme (2014 to 2020), with most of the funding being channelled through the EU's flagship research programme Horizon 2020. In their publication Cycling for Growth, ECF estimates that "*1.325 billion Euros of EU funds have been used for cycling based on the explicit references included in the current versions of the programming documents and by combining the implicit and indirect references.*" This is more than twice (and in some cases as much as three times) the amount in the period 2007 -2013. A large proportion but not all was earmarked for research purposes. The ECF also notes that the "*distribution of the funds is unequal among countries and regions and there is still the need for significant national, regional and local investments in every country. This has not been done for walking and it should be recognised that the EU is one of the largest regional funders of collaborative research internationally."*

Funders that were included in the category "other" (see graphic 8) included: international organisations such as the WHO, FIA Foundation, UNEP, UNHABITAT, ITDP, the WRI, international expert organisations and networks such as Walk21, development banks[29], philanthropic foundations, and national and local actors. Some respondents also felt that funding streams were often contextual and that there is a high level of, and growing, interest from industry and the private sector in developing relevant business models, especially technology companies and start-ups. Examples include Google / Sidewalk Labs; Uber; Ford Motor Company, Volvo, General Motors, BMW and other auto companies. One respondent noted "*It's super important to understand the implications of this in terms of: 1) opportunities and partnerships and promotion and funding and financing and 2) the risks*."

3.2 Identifying the main international players

Respondents were asked to identify key advocates for active transport[30]. The top ten references were (in decreasing order of number of mentions):

- Institute for Transportation and Development Policy (ITDP)
- Walk21
- GIZ/TUMI/SUTP
- Ross Centre for Cities/WRI
- ECF & World Cycling Alliance
- FIA Foundation
- WHO
- EU Commission
- SLOCAT (Sustainable LOw CArbon Transport partnership)
- UNEP/Share the Road Programme/UNHABITAT.

A number of agencies such as UN agencies (e.g., UNHABITAT/UNEP), C40 and ICLEI (regional chapters and the Ecomobility programme), Healthbridge, a number of regional or local associations (e.g., Despacio, Fundación Peaton), NACTO and VREF itself were scored as being major funders but did not enough to be in the top 10. Nor were the multi-lateral development agencies (such as development banks, DFID, etc.) or other well-

[28] Cycling for growth (2014). https://ec.europa.eu/transport/sites/transport/files/cycling-guidance/ecf-cycling-for-growth-using-european-funds-for-cycling_0.pdf
[29] Although there were also a lot of comments on the need to get active transport better recognised within international funding agencies. They, themselves are populated by economists and engineers who are more comfortable building vehicle infrastructures such as roads and flyovers, than sidewalks and cycle lanes. No development bank was mentioned as an 'advocate of active transport'.
[30] This list is indicative rather than comprehensive.

known players in the Global North such as Sustrans (UK), Living Streets, and the International Federation of Pedestrians. A total of 65 players were mentioned by name but they were quite fragmented by geographical region.

In terms of the main players, few organisations contained the association of active transport in their titles and many focussed on one specific aspect of active transport.[31] International cycling advocates were easier to identify and more numerous in an Internet search than advocates of walking and examples include World Bike Relief, World Cycling Alliance. Nonetheless several examples of walking interest groups could be identified (apart from those already mentioned), with most being regional or national such as America Walks (plus similar other country chapters), and The Right to Walk Foundation (India).

Efforts to identify the most well-known research programmes in the area of active transport were inconclusive. It was telling that respondents felt that there was "not much research" – while the literature review revealed that there is an extensive volume of publications on the subject (see section on the findings from the literature review). This implies that much of published research is either not visible or considered not relevant. For example, the many papers on health benefits of walking may not be considered relevant by transport professionals as the benefits are not specific to transport or monetised within the sector. The numerous toolkits and guidance documents, especially on cycling, have not led to widespread action on the ground either. Thus, communication and dissemination may be important aspects to include in any future research programmes, as well as support for networks to provide momentum for both policy development, investment and implementation.

Section 4: The international context and VREF

4.1 Fit with international developments

VREF research is intended to inform and contribute to the global research agenda on sustainable transport. VREF programmes are aligned to international policy agendas, including the Agenda 2030 Sustainable Development Goals (SDGs) and, where possible, with other political agendas (such as the Paris Agreement on climate change and New Urban Agenda). The SDGs provide the global blueprint for a more sustainable future for all, addressing the global challenges of poverty, inequality, climate change, environmental degradation, peace and justice. September 2020 marked the fifth anniversary of their adoption, but with only a decade remaining progress toward achieving the goals has been slow.

Based on the gaps and priorities identified, research on various aspects of active transport could contribute to achieving the following SDGs:

- Goal 1: End Poverty
- Goal 3: Good health and well-being
- Goal 5: Gender Equality
- Goal 7: Sustainable Energy
- Goal 11: Sustainable cities and communities.

The results of this study indicate that active transport can be aligned with the following topics: poverty, health, inequality and transport justice, climate change and sustainable urban life. In terms of climate change, active transport is recognised as a low-carbon transportation mode and has been for decades. There is a wealth of evidence to support this, although it is not yet being leveraged in climate actions. Additionally,

[31] The University of Westminster London now has an Active Travel Academy set up in September 2019, at the University of Westminster funded by a grant, to bring together expertise to lead research, teaching and knowledge exchange, with a focus on walking and cycling, and other 'micro mobilities' from e-scooters to electric hand cycles who are doing some interesting projects such how the media reports active travel. (N.B. they use active travel not active mobility).

the recent pandemic and health crisis has exposed numerous knowledge gaps while, at the same time, active transport (especially walking) has gained ground as a core component of health (mental and physical), social cohesion and inclusion, and contributing to the resilience of cities.

4.2. Impacts of COVID-19 on Active Transport

The world has been devastated by the unprecedented health and economic impacts of the COVID-19 pandemic. The pandemic has also changed the landscape of urban transport, severely impacting current urban public transport systems, especially mass transit. This has resulted in unexpected, increased attention and interest from cities in active transport and there has been a surge in both walking and cycling, as short distance travel increased. Fewer people are commuting or travelling for educational purposes and more people are "keeping local," resulting in shorter distance trips.

On the other hand, as people turned to walking and cycling locally during the pandemic the infrastructure for the increased demand for active transport was simply missing in many places. This was further complicated by having to allow for safe social distancing. Many cities introduced temporary "pop-up" interventions such as bike lanes, parklets and wider sidewalks as measures to accommodate the need for social distancing, and existing plans for implementing cycling and walking measures have been accelerated. Sharing successes and learning from efforts to adopt such measures between cities and regions, and investigating which interventions may become permanent, are also areas of potential interest. Investigating the extent of temporary and/or permanent changes (for example in infrastructure and behaviour) could provide rich and new knowledge.

Active transport is a relatively new area of research, and a number of research gaps were identified in this study that can be put in the spotlight, especially regarding **equity and active transport infrastructure**. People's **travel behaviours, but also their mindsets and opinions about travel, have changed significantly** over the past year. The pandemic has **highlighted limitations in existing active transport infrastructure** and the level of capacity that is required at the city level to respond to increased demand for support as a result of these changes. These observations also present opportunities for integrating the equity, data-collection and governance priorities identified in the survey responses.

Section 5: Conclusions

5.1 Key findings

This study shows that there are many papers and reports available on the various individual components of active transport modes, yet despite a large number of publications there is a generalised lack of visibility of the volume and content of work on this topic. The studies appear to have remained within the academic communities and have not attracted the attention of politicians and decision makers, and as a result implementation of research findings is considered weak. **The research in this field remains fragmented** and **there are numerous gaps between research and practice**, and many unanswered research questions. This is particularly apparent in middle- and low-income countries. A general observation from the survey results is a bias toward promoting modal shifts (usually from motorised to non-motorised modes in the Global North and vice versa in the Global South) rather than encouraging citizens to consciously choose active modes as a transport choice.

It is well documented that walking is by far the dominant mode of transport for much of the developing world, but both walking and cycling get little attention compared to motorised transport when it comes to planning and investments and the **evidence base for supporting it in these regions is poor**. Active transport can be considered to be a key pro-poor measure and can provide the transport underserved (particularly migrant and low-income), peri-urban, informal and slum communities access to opportunities. This is true for

all regions, but it has greater importance in the Global South which is currently less motorised. However, the barriers and enablers for these modes vary widely and under researched topics include economic and distributional aspects, social norms, education, how they intersect with active transport. For example, in some communities (particularly in Asia and Africa), girls are allowed to cycle to school, but women are not able to cycle in public spaces.[32] This constrains women's mobility and access as they have fewer transport choices in adulthood.

Cycling has received more attention than walking especially in the Global North and, in general, there is **more interest in it compared to walking from both transport researcher and policy makers.** Cycling and walking are key modes of active transport to be regarded and addressed as two distinct active transport modes. This appears to be the case for research but not for policy. More attention in research to encourage the integration of different sustainable modes, while better recognising their strengths, would bring numerous advantages.

Active travel is well understood as a term although there is some evidence of regional differences. Nonetheless, there is an on-going debate regarding the terminology used in research and practice with polarised opinions about the choice between the terms active transport (and its variations – active travel/transportation) and non-motorised transport (NMT). The term NMT is widely used. The main criticism of the term NMT is that it compared walking and cycling with motorised transport and implies that this is better than non-motorised modes. Critics also cite that NMT's most applied definition fails to include the new modes, such as micro-mobility.

Taking all the views expressed into account, the primary benefit of using the term active transport is to underpin the positive attributes (such as health benefits). It is also somewhat fresher as a term than non-motorised transport and can be used to include new alternative and emerging modes. "Active travel for transport" may be an acceptable alternative, as it clearly specifies the transport context, but it is quite long. From the discussions, a new term may be useful to reinvigorate interest in these modes as it disassociates this area of research from traditional transport terminology and makes way for including the new alternative and emerging modes, especially in the urban context. On the other hand, non-motorised transport is a well-established and understood term and is frequently and widely used. Furthermore, it works well in the transport context of the search engines used to locate published work.

Current use of terminology could benefit from being re-framed, enabling non-motorised modes to be (re)presented to policy makers, investment decision makers and funders of research in a more dynamic and integrated fashion. This is seen as being particularly necessary to help get walking recognised as a transport mode. Pedestrians are often classed as "walkers," i.e., citizens who walk for pleasure rather than as a means of transport. Moreover, much of the literature on walking is focused on pedestrians as vulnerable road users, documenting vehicle-pedestrian collisions and lack of pedestrian safety, which reinforces a negative image of walking as a transport mode. This is also true to a lesser extent for cycling. The cultural dominance and convenience of the motor vehicle has led urban space to be allocated disproportionately to meet the needs of vehicles, to the detriment of pedestrians. Until walking and cycling are more widely recognised as transport modes in their own right, it is likely that car owners/drivers will continue to win the competition for urban space. **This finding is important** in the context of FUT 3.0, as it emphasizes the importance making terminology choices carefully to reflect the desired vision and expected outcomes of the programme.

The COVID-19 pandemic has put the spotlight firmly on the societal benefits of active transport modes, providing an opportunity to re-frame and re-invigorate political and practitioner perspectives on active

[32] Jennings, G; Allen, H; Arogundade, E. Gaining or Losing Ground: Ensuring that post-COVID-19 transportation serves the needs of women in low income in African cities. High Volume Transport Applied Research; 2020 Dec. (COVID-19 and Transport Response and Recovery). http://transport-links.com/download/gaining-or-losing-ground-ensuring-that-post-covid-19-transportation-serves-the-needs-of-women-in-low-income-sub-saharan-african-cities/

transport and travel. The recent pandemic has increased interest in active transport in the Global South, especially with respect to cycling, and to some extent, walking in Africa. For example, both men and women who learned to ride a bicycle in their youth have been able to take up cycling during the pandemic, when all motorised travel has been banned (for example in Uganda). This has increased the resilience of urban populations during the pandemic.

The recommendations below are are based on the findings of this study (see graphic 8) and are put forward for consideration when defining the scope of a new phase of research funding. Those related to technical and social research aspects have been developed primarily based on the survey responses, comments, and the interviews, while the recommendations related to education and communication are based on the literature review and the interviews. This list has been validated by a reference group following an initial review and presented in two workshops to gather further input. The integration of active transport in the design of built environments with respect to interactions with other traffic, mobility choices, accessibility, liveability, and quality-of-life/wellbeing, were also widely supported by the reference group. These topics are included in the planning aspects.

By triangulating the responses, interviews and identified literature gaps, the following are the top ten priority areas for future research:

1. Data collection generally and specifically e.g., on trip purpose, gender, etc.
2. Governance (including institutional and societal aspects)
3. Evaluation tools to show impacts
4. Policy development (including changes due to COVID-19)
5. Planning aspects
6. Active transport and new mobility
7. Intersectionality with other modes (including comparing modes, e.g., cycling with rather than versus walking)
8. Safety and security, especially what creates safe and secure environments for active transport, and how does lack of safety and security impact choosing these modes.
9. Research capacity (generally and applied).
10. Urban freight.

The **thematic areas and priority topics** can be further clustered and grouped, with educational support as a cross-cutting horizontal theme. This may be helpful for contextualising the research. All the key thematic and priority areas can also be mapped to illuminate interactions between them. For example, getting more women to cycle can be associated with poverty reduction. Similarly, the societal and technical aspects of equity and planning, as well as supporting the overarching objectives of achieving the SDGs.

5.2 Next steps and possible entry points

For decades, the transport sector's approach to planning and investing has been based on a forecast-led "predict-and-provide" planning paradigm. This approach involves efforts to anticipate the future demand for travel (usually focused on motorised road or rail modes), highlighting the benefits of speed and distance. The data collection processes used either under count or do not include short distance trips. The resulting evidence base is used to plan the system expansion and make investments that ensure there is capacity (supply) to serve the predicted increased demand. This approach clearly overlooks the needs of active transport users and does not promote active transport modes. Over the years the dominance of the predict-and-provide transport planning has led to a lack of in-depth, quantitative and qualitative studies of active travel/mobility behaviours and overlooked the needs for walking and cycling.

Transport does not merely serve society but is also shapes it. Thus, in order to redirect people's mobility away from fossil fuel based motorised transport and make low carbon sustainable modes more attractive, in the face of the current uncertainty about future demand, we need to change this planning approach. In place of a forecast-led predict-and-provide paradigm, shifting transport planning towards a vision-led 'decide-and-provide' paradigm[33] (i.e., determine a desirable future and plan transport to achieve it) would seem appropriate. This would allow transport to become more sustainable, supporting the emergence of a future society aligned with low carbon living. A change in our current paradigm is certainly called for, but robust evidence and new research will be also required to support that change. There is no lack of scholarship in active transport but despite the significant amount of research that has been published, this has not resulted in implementation by practitioners. New knowledge should support the realisation of a desired, rather than a predicted, future. Crucially, a "decide-and-provide" approach may also help us negotiate the deep uncertainty over the future, brought about by changes that are beyond our direct control, such as the COVID-19 pandemic.

New planning and business models have already started to take shape, spurred by the disruptive influences of shared and micro-mobility which intersect with active transport modes. This, combined with the experience of the past year and the international sustainability agenda presents a unique opportunity to **accelerate deep changes in travel patterns**, choices, and behaviours the likes of which were not thought possible prior to the pandemic. There are early indications of deep mind-set changes from both users (who create demand), and those who supply transport. Evidence-based and applied research can further amplify this change, highlighting the strategic importance of active transport and indicating ways to accelerate the adoption of sustainable, low-carbon transport through the promotion of active transport modes. New strategic models are likely to also be required to help manage change in today's uncertain world[34]. The results of this paper can be used by VREF to **frame the scope of a new research programme**, to ensure that it is both future looking and appropriate for a world that is quite different from the context in which FUT was established.

[33] Lyons G., Guidance for transport planning and policymaking in the face of an uncertain future (2016) Transportation Research Part A Policy and Practice 88:104-116 DOI:10.1016/j.tra.2016.03.012

[34] An example is VUCA (Volatility, Uncertainty, Complexity and Ambiguity) an acronym that emerged from the leadership theories of Bennis and Nanus (1987) that has led to dynamic discussions and debate at political and community levels about how we can live in a world that is quite different to the one that we previously had 'planned'. Contrary to many slogans, the antidote and solutions also correspond to the same acronym, VUCA - Vision, Understanding, Clarity, and Adaptability/Agility. This is just an example of a new strategic model that could be adapted to transport planning and investments.