



A BEHAVIOURAL SYSTEMS APPROACH TO ACTIVE SCHOOL TRAVEL IN SURREY

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ABBREVIATIONS

AST = Active school travel

CG = Central government

COM-B = Capability-Opportunity-Motivation-Behaviour (model of behaviour)

DfT = Department for Transport

FESC = Families and Educators for Safe Cycling (project in Toronto)

IP = Interview participant (followed by a number)

LA = Local authority

LG = Local government

NGO = Non-governmental organisation

OSF = Open Science Framework

PE = Physical education

PRSM = Participatory Resource System Mapper (software used for digitising systems map)

PTA = Parents and Teachers Association

SCC = Surrey County Council

SMOTS = Sustainable Mode of Travel to School strategy

SRNZ = School Run to Net Zero (project in Scotland)

STP = School Travel Plan

UoS = University of Surrey

WP = Workshop participant (followed by a number)

GLOSSARY

AST champions = Individuals who will support and advocate for active school travel

Community animators = AST advocates who work alongside communities to build long-term, deep engagement, empowering and amplifying the community's voice

Footway = Paths intended for pedestrians (e.g., pavements)

Intervention developers = Professionals involved in the design, building or implementation of behaviour change programmes

Liveability = The degree to which a place is safe, healthy, and desirable to live in, encompassing long-term community wellbeing

Road Safety Outside Schools = A SCC policy used for investigating and responding to concerns about school road safety. The seven-stage, multi-stakeholder process is initiated when an individual or organisations submits a request for road safety improvements, and involves conducting a road safety education assessment, and identifying, costing and potentially implementing highway improvements

Sports Premium Funding = A government grant awarded to primary schools for promoting physical activity

Stakeholder (in AST) = Individuals, or representatives of organisations, whose behaviour has the potential to influence active school travel among children

EXECUTIVE SUMMARY

BACKGROUND

The Department for Transport has set a target of 60% of children aged 5 to 16 travelling actively to school by 2035, but many school journeys in Surrey continue to be made by car. Our Phase 1 report, published in 2025, recommended adopting a systems-based approach to promote active school travel (AST) in Surrey (<https://tinyurl.com/astsurreyphase1>).

This report describes progress in developing a *behavioural* systems approach to AST in Surrey, which involves identifying *who* could do *what* differently to enable children to travel actively.

We set out a behavioural systems mapping project, undertaken to identify the complex network of stakeholders, and the behaviours that are or could be performed by stakeholders, that enable or hinder AST in Surrey.

AIMS AND OBJECTIVES

The primary aim of the project was to construct an evidence-based behavioural systems map of AST in Surrey, to inform strategic decisions regarding *who* in the system to target, and *what behaviour change(s)* to target, to encourage greater AST in Surrey.

Specific objectives were to:

- Review existing literature surrounding actors and actions identified in other AST contexts
- Consult with local stakeholder experts to identify barriers, stakeholders and behaviours within the Surrey AST system
- Synthesise these inputs into an integrated behavioural systems map specific to the Surrey AST system

Two work packages were undertaken:

- A review of previous literature identifying stakeholders and behaviours in the AST behavioural system
- An expert consultation exercise, to collaboratively map the behavioural system

LITERATURE REVIEW

A review of 12 published studies and 5 ‘grey literature’ sources identified a broad range of stakeholders, beyond parents/caregivers and children, whose actions influence AST. Stakeholders and behaviours were identified by reviewing sources in which problem analyses had been undertaken, or where stakeholders had been involved in intervention co-design or delivery. Key actors included central and local government departments, police, urban designers and third-sector organisations.

We present two case studies demonstrating how stakeholders have been involved in past AST promotion initiatives. One illustrates how stakeholders can be comprehensively engaged,

through involvement in developing an understanding of AST engagement, and designing and delivering an AST intervention. The other case study highlights the positive impact of employing a pivotal individual within the behavioural system (i.e., a ‘community animator’) to build engagement, bridge gaps between other stakeholders, and thereby enable cultural shifts towards AST in schools.

EXPERT CONSULTATION AND MAPPING

Two rounds of workshops and interviews were undertaken, with a total of 30 individual stakeholder representatives, to incrementally co-create a behavioural systems map. The first round developed a map of key barriers and facilitators to AST in Surrey. Core barriers including distance, parental time pressure, and concerns about traffic and driver behaviour. In the second round, stakeholders refined a list of stakeholders and actions into ten clusters, distinguishing between those necessary for systems-level leadership (e.g., securing funding, cross-sector coordination) and those needed to tackle AST barriers from the first-round mapping activity (e.g., infrastructure maintenance, skills training). A subsequent synthesis stage finalised the map, combining stakeholders and behaviours with broader system barriers.

A BEHAVIOURAL SYSTEMS MAP OF ACTIVE SCHOOL TRAVEL IN SURREY

Our behavioural systems map was developed using a layered approach. We first constructed a non-behavioural map, concentrating on barriers and facilitators of AST in Surrey. Next, we generated a list of behaviours and stakeholders for inclusion in a behavioural systems map. Finally, we layered the behaviours and stakeholders on to the systems map, so generating an overarching, behavioural systems map. Each of these three components offers a standalone, key output.

Three Key Outputs

We offer three outputs of the mapping process:

1. A (*non-behavioural*) *systems map*, outlining barriers and facilitators to enabling AST in Surrey (see Section 4.1). This is a useful standalone source for understanding system barriers to AST.
2. A *list of stakeholders and behaviours* that may influence AST or greater uptake of AST in Surrey (see Section 4.2). This is a useful standalone source for identifying which stakeholders could take which actions to encourage AST in Surrey.
3. An integrated, *behavioural systems map of AST in Surrey* (see Section 4.3), which combines the non-behavioural systems map and list of stakeholders and behaviours. This is a useful source for identifying which behaviours might be changed to promote AST, among whom, and which system barriers such behaviour changes would address.

The final, interactive behavioural systems map is available at <https://tinyurl.com/surreyastbhvrlmap>.

Guidance for using the map is provided in Section 4.3.

RECOMMENDATIONS

We offer seven recommendations, covered in more detail in Section 5.

Four recommendations were generated by stakeholders during the expert consultation:

1. Create a formal, multi-agency active travel partnership
2. Improve active travel infrastructure and manage traffic on routes to schools and roads around schools
3. Provide more resources to schools and recruit and empower AST champions
4. Support elected representatives to make and defend AST-supportive decisions

We offer three recommendations for systems-based leadership:

5. Ensure stable sources of funding for systemic AST change
6. Identify a lead organisation and individual to manage multi-sectoral collaboration
7. Ensure that the separation of Surrey County Council into East and West Unitary Authorities does not derail AST promotion activities

1. INTRODUCTION

BACKGROUND

Active travel – i.e., “everyday ‘journeys for a purpose’ made by walking, wheeling or cycling” (UK Parliament, 2025) – offers a low-carbon, health-promoting school travel option. In June 2026, the Department for Transport’s (DfT) third Cycling and Walking Investment Strategy set a target for 60% of children aged 5 to 16 to travel actively to school by 2035 (DfT, 2026). Surrey County Council’s Annual School Travel 2024 survey showed that while around a third of primary school children and half of secondary school children walk to school, 43% of primary school children and 15% of secondary school children travel to school by car. Shifting travel mode choices requires changing behaviour.

In May 2025, we published a report, commissioned by Surrey County Council (SCC), that sought to develop understanding around how to support schools to set and evaluate School Travel Plans (i.e., coordinated behaviour change interventions devised by schools to encourage active school travel; Gardner et al., 2025). Drawing on findings from focus groups and two literature reviews, we offered a key recommendation for developing and evaluating active school travel initiatives:

“Active school travel initiatives should be developed using a ‘systems-based approach’. In practice, this involves a collective effort coordinated across multiple stakeholders to develop, administer, and evaluate initiatives that target not only individual-level behaviour change but broader, systemic change.”

(Gardner et al., 2025, p5)

Our 2025 report represented Phase 1 of a broader SCC project to develop effective active school travel promotion initiatives. Following publication of the Phase 1 report, and its presentation at a UoS hosted showcase event, SCC undertook a stakeholder survey amongst the event’s attendees to gauge the acceptability of adopting a systems-based approach to encourage AST. From this group, 62.5% strongly agreed, and 37.5% agreed, with adopting this new approach to encouraging AST. Twenty-one key organisations and 11 key processes were identified as potentially important to generating an AST system-map for Surrey.

The current report contributes to Phase 2 of SCC’s project and seeks to develop a systems-based approach to promoting AST in Surrey, through a behavioural system-mapping process.

WHAT IS A BEHAVIOURAL SYSTEMS APPROACH?

Behaviour change intervention development frameworks propose that, to create interventions most likely to be effective in changing a given behaviour, it is important to first understand the behaviour and why it does or does not occur (e.g., Michie et al., 2014). Adopting a systems-based approach to explain why children do or do not travel actively to school involves looking beyond factors internal to the key actors (e.g., children or their parents/caregivers) or inherent to the action itself (e.g., how enjoyable active travel is). Rather, travel mode decisions are shaped by, and situated within, a complex, interconnected network of environmental barriers

and facilitators, such that targeting these barriers might bring about changes in active travel uptake. In our Phase 1 report for example, we found that parents/caregivers of primary school children were concerned about the safety of local footways, suggesting that active travel could potentially be increased by improving street infrastructure, rather than intervention with parents/caregivers or children.

Behavioural systems mapping is an emerging methodological approach that incorporates behavioural science into systems mapping (e.g., Davan Wetton et al., 2025; Michie et al., 2014; West et al., 2020). While ‘traditional’ mapping focuses on general barriers and facilitators, behavioural mapping specifically identifies the network of actors (*stakeholders*) – such as local authorities, planners, and school staff – and their actions (*behaviours*), and how these impact the main behaviour of interest (i.e., AST). Behavioural systems maps are useful for strategically intervening to change behaviour among stakeholders within the broader ecosystem. Adopting a behavioural systems approach helps intervention developers to identify *who* could do *what* differently to enable children to travel actively.

Our Phase 1 report testified to the need for a behavioural systems-based approach. For example, parents/caregivers reported that if the local authority (stakeholder) were to better maintain local pavements (behaviour), this would alleviate their safety concerns (barrier) and so encourage them to support AST among their children (main behaviour of interest). Similarly, school staff reported feeling powerless to manage antisocial driving among parents/caregivers. They suggested that police or civil enforcement officers (stakeholders) should enforce parking restrictions (behaviours), to create an environment conducive to safe active travel (main behaviour of interest). Behavioural systems mapping supports intervention developers to adopt strategies that look beyond direct intervention with the most proximal stakeholder(s) – i.e., children, parents/caregivers – and instead focus on other actors and actions that may offer more feasible or impactful alternative leverage points.

The Behaviour Change Wheel approach to intervention design recommends constructing behavioural systems maps to identify which behaviour(s) to target, and then conducting ‘behavioural diagnoses’ to identify the specific barriers to change (Michie et al., 2014). Behavioural diagnoses are systematic appraisals of the factors that prevent or facilitate a target behaviour (Michie et al., 2014). The COM-B Model provides a framework for this appraisal, proposing that three fundamental determinants are necessary for any behaviour to occur: capability, opportunity, and motivation (Michie et al., 2011; see **Figure 1**). The three determinants can be broken down further. Capability comprises physical capability and psychological capability (i.e., the capacity to engage in thought processes needed for an action to occur). Opportunity comprises physical opportunity and social opportunity (i.e., the conduciveness of the social environment to action). Motivation comprises reflective motivation (based on conscious thought processes) and automatic motivation (emotions, habits, and impulses). The three COM-B determinants can be used to classify the specific barriers to changing any behaviour – for example, a lack of staffing resource can be understood as a *physical opportunity* barrier to encouraging enforcement officers to enforce parking restrictions around schools.

Mapping the behavioural system surrounding AST in Surrey requires identifying the network of stakeholders and behaviours that surround active travel choices among parents/caregivers, and understanding the COM-B barriers to changing these behaviours. Evidence must be consulted throughout this process, to ensure the map is grounded in empirical observation (e.g., Davan Wetton et al., 2025). Such evidence can take multiple forms. While a systems map of AST in Surrey will necessarily be specific to the Surrey context, *peer-reviewed scientific evidence* can be drawn on to reveal stakeholders that have been implicated in AST and its

promotion in other contexts, which may also be relevant to Surrey. Policy papers, technical reports and other such ‘grey literature’ can also be drawn upon to reveal whether and which stakeholders and behaviours have been identified as priorities in similar travel contexts. Stakeholders themselves may also be consulted, to derive expert opinion from the lived and professional experiences of known stakeholders in the active travel system. Although this approach requires prior knowledge of at least some relevant stakeholders, expert input can also identify further stakeholders, resulting in a ‘snowballing’ of expert insight.

AIM

This report describes work undertaken to enable Surrey County Council, and other stakeholders, to adopt a behavioural systems-based approach to encourage AST within Surrey.

The aim of the project was to construct an evidence-based behavioural systems map of AST in Surrey, to inform decisions around how, among whom and on which behaviours to intervene to promote AST among Surrey’s school-travelling population.

OBJECTIVES

Specific project objectives were to:

- identify actors and actions that influence AST systems by drawing on existing evidence
- consult with local experts and stakeholders to generate a credible list of behaviours that are, or could be, performed by actors in the AST behavioural system, and which could be targeted to bring about changes in AST in Surrey
- synthesise this evidence into a behavioural systems map of the AST system in Surrey, to inform future work to develop, deliver or evaluate interventions to encourage AST

METHODS

Work packages

We undertook two sequential work packages:

- *Evidence review*: we first reviewed published scientific literature and unpublished ‘grey literature’ (e.g., policy papers), to identify stakeholders and behaviours shown to influence AST in other contexts, providing baseline input for our Surrey-specific map.
- *Expert consultation and participatory mapping*: we ran two rounds of workshops and interviews with stakeholders in Surrey, including local authority staff, and school representatives. We sought to collaboratively develop our map, by identifying stakeholders, behaviours, and barriers specific to the Surrey AST system.

Synthesising findings from these two work packages allowed us to generate a behavioural systems map grounded in both research evidence and the lived and professional experiences of those working within the Surrey AST system.

We supplemented our literature review with two case studies of stakeholder involvement in the development, delivery or evaluation of AST, to share in-depth learnings relevant to a systems-based approach.

Project team

This project was undertaken by four researchers: a psychologist, with expertise in behavioural science theory, application and methods (Prof Benjamin Gardner [BG]); an environmental social scientist, with expertise in systems thinking and systems mapping processes (Dr Valentine Seymour [VS]); and two research assistants, with postgraduate psychology qualifications, both currently undertaking doctoral research in psychology (Annabel Rivers-Stone [AR-S]; Sophia Shaw-Brown [SS-B]).

Overview of mapping process

As an emergent method, there is no standardised, consensually agreed procedure for behavioural systems mapping. As **Figure 1** illustrates, we developed our map incrementally, based on previous literature, expert consultation, and participatory mapping.

We first developed a non-behavioural systems map, designed to incorporate barriers and facilitators of AST among parents/caregivers and children. When the non-behavioural map was completed, we next developed a *behavioural* systems map. This was constructed by incorporating an agreed set of stakeholders and behaviours into the non-behavioural map.

Specific stages in this process were as follows.

STAGE 1: Developing a baseline systems map (May 2026)

Aim of Stage 1: To develop an evidence-informed ‘baseline’ systems map for discussion in the first workshop and first set of interviews.

Method: Time constraints dictated that each expert workshop lasted no more than 3 hours. We deemed it unrealistic to expect experts to co-develop a comprehensive systems map in this time. We therefore developed a baseline map to stimulate discussions in the first workshop and first set of interviews.

The literature review was undertaken (by AR-S) in April-May 2026. While the review was ongoing, AR-S worked with VS and SS-B to create the baseline map, based on emergent insights from the ongoing literature review and our Phase 1 report.

Output: Systems Map v1.

STAGE 2: Refining the map and identifying stakeholders and behaviours (May-June 2026)

Aims of Stage 2: To further develop the baseline systems map using participatory mapping approaches, and to generate a list of stakeholders and behaviours for later incorporation into the map.

Method: In the first workshop (led by VS, assisted by BG, AR-S and SSB) and first round of interviews (conducted by VS and SS-B), Systems Map v1 was discussed and refined. Workshop and interview participants were also asked to suggest stakeholders, and behaviours that these stakeholders could do, to leverage change in the system depicted by Systems Map v1.

On completion of the literature review (late May 2026), a list of stakeholders and behaviours identified in previous research was extracted and categorised into clusters (by BG). This was combined with insights from verbatim transcripts of the first workshop and first round

of interviews (extracted by SS-B and BG), to generate a list for discussion in the second workshop and second round of interviews.

Output: Systems Map v2; List of Behaviours and Stakeholders v1.

STAGE 3: **Reviewing the map and list of stakeholders and behaviours (June 2026)**

Aims of Stage 3: To review and refine the non-behavioural systems map, and further develop the list of stakeholders and behaviours, for later incorporation into a behavioural systems map.

Method: In the second workshop (led by VS and BG, assisted by AR-S and SS-B) and second round of interviews (conducted by VS and SS-B), Systems Map v2 and the List of Stakeholders and Behaviours v1 were discussed in turn. Participants were asked to verify Systems Map v2; review the List of Stakeholders and Behaviour v1 for its comprehensiveness, adding, removing, combining or relabelling stakeholders or behaviours as necessary; and offer intervention recommendations based on the map, list, expertise and experience.

We opted not to use a participatory mapping approach – which would have involved attendees in the process of incorporating stakeholders and behaviours into the systems map – because we deemed it an unrealistically complex task for a 3hr workshop or 1hr interview. Instead, we focused on collecting detailed information from attendees to inform our own synthesis, which took place at Step 4.

Output: List of Behaviours and Stakeholders v2.

STAGE 4: **Finalising the map (June 2026)**

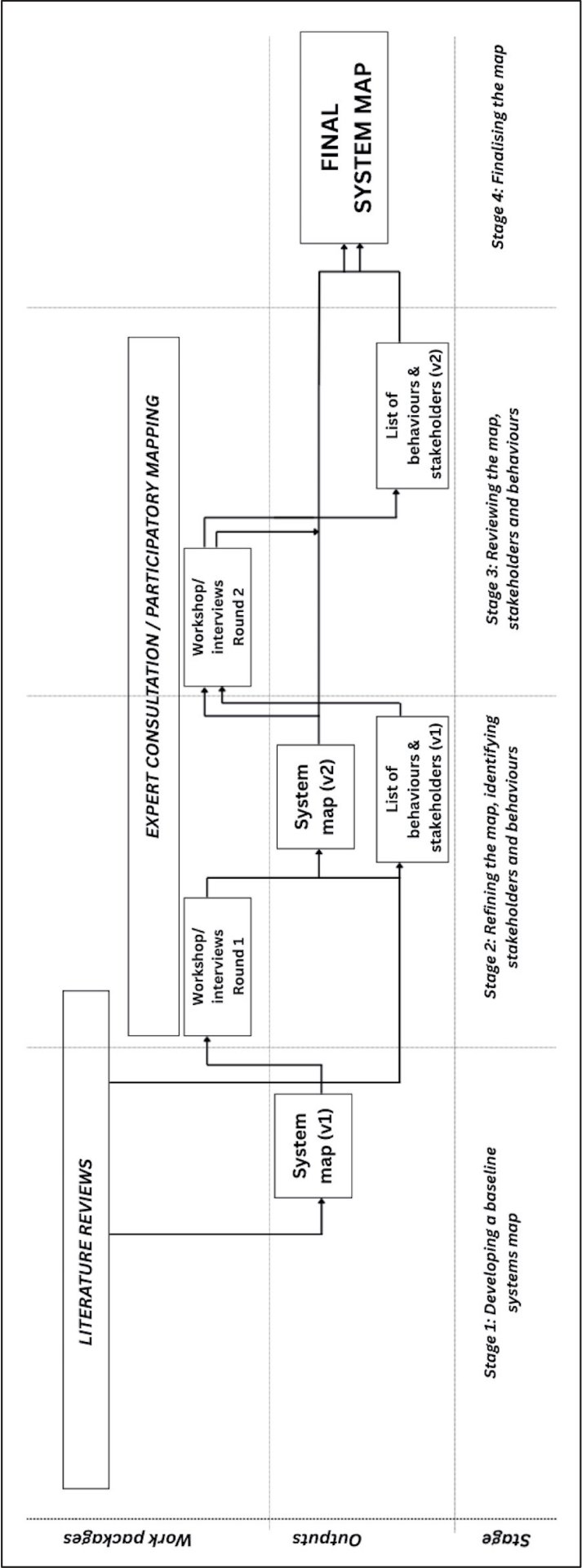
Aim of Stage 4: To develop a final behavioural systems map, by incorporating the refined list of stakeholders and behaviours into the non-behavioural systems map.

Method: Synthesis was conducted by all team members in mid-June.

Output: Final Systems Map.

All project materials are freely available on the Open Science Framework collaboration and management platform (accessible at <https://osf.io/za2wb>).

Figure 1. Overview of procedures: development of an AST behavioural systems map



2.

LITERATURE REVIEW

AIMS

This work package was undertaken to review published studies, and unpublished reports and other documents (i.e., ‘grey literature’), to identify which stakeholders and behaviours have been identified as situated within AST systems.

OBJECTIVES

Specific objectives were to:

- identify sources in which stakeholders and behaviours have been identified as being situated in AST systems
- identify barriers to changing behaviours situated in AST systems
- identify the roles that stakeholders, and their behaviours, have been suggested to play in shaping, influencing, delivering or evaluating AST initiatives

To maximise informational value we also sought to describe:

- two case studies illustrating stakeholder identification and/or involvement in AST intervention design and/or delivery

METHODS

We undertook two complementary literature reviews – a review of published, peer-reviewed scientific literature, and a review of unpublished literature (e.g., policy reports) – to identify which stakeholders and behaviours have previously been identified as relevant to AST and its promotion.

PUBLISHED-LITERATURE REVIEW: Search and screening procedures

Two online databases (Web of Science and Scopus) were searched on April 27th 2026 for sources published since 2000. Search terms were synthesised from key concepts relating to (a) AST, and (b) behavioural systems. Key terms were searched for in title and abstracts.

In our Phase 1 report, we recommended adopting a systems-based approach to help AST intervention designers look beyond focusing only on parents/caregivers and children. We therefore sought literature that identified stakeholders other than parents/caregivers and children.

Sources were eligible for inclusion if they used a behavioural systems-based approach to (a) understand attitudes, beliefs, or behaviour surrounding AST among (b) stakeholders other than parents/caregivers or children, or to (c) develop, deliver or evaluate an intervention promoting AST. We also included sources that (d) reported primary or secondary qualitative analyses, or a systematic review, or an application of the COM-B Model, to identify barriers to AST among stakeholder groups.

Sources were screened by AR-S and BG.

GREY-LITERATURE REVIEW: search and screening procedures

Google and Google Scholar were searched on 27th April 2026, using search terms relating to systems-based approaches, AST and transport, for sources published in the last five years. Eligibility criteria were the same as for the published-literature search.

DATA EXTRACTION AND ANALYSIS

Where multiple sources reported analyses from a single dataset or project, these were treated as a single source for analysis purposes.

Published literature. Core characteristics of each source were extracted, including the purpose of the source (e.g., to understand the determinants of, or develop an intervention to promote, AST), which schools or child ages were the focus, and the country. We coded for which stakeholders and behaviours were identified in the source, the presumed role of the stakeholders in influencing or changing AST, and how they were identified. Although we excluded sources in which only parents/caregivers or children were identified as stakeholders, we extracted data on the role of parents/caregivers from eligible studies to contextualise the identified roles of other stakeholders.

Two sources, selected for their comprehensive involvement of stakeholders (other than parents/caregivers and children), were selected as case studies. From these, we also extracted intervention details.

Grey literature. Characteristics extracted from these sources included country, and which stakeholders and behaviours were identified.

FINDINGS

Summary of dataset

Published literature. Of 30 sources identified from the searches, 15 were eligible for inclusion. The 15 sources included four from the same authorship team relating to the same intervention. The final number of unique sources reviewed was 12.

Grey literature. Five relevant sources were identified.

CATEGORISATION OF SOURCES

We inductively categorised sources according to how stakeholders were identified.

- In eight sources, stakeholders and behaviours were **identified via a problem analysis** (or 'behavioural diagnosis'). That is, the study authors observed or proposed that these stakeholders and their behaviours contribute to the obstruction or facilitation of AST. These sources indicate which stakeholders and behaviours may help or hinder AST, and were found in the published literature only.
- In seven sources, stakeholders were **involved in co-designing or developing one or more AST interventions**, which we interpreted as recognition of the stakeholders' role within the AST system. These sources indicate which stakeholders may have a role to play in informing the development of AST interventions, and were found in the published literature only.
- In eight sources, stakeholders were **involved in delivering or evaluating one or more AST interventions**, which we interpreted as indicating that the stakeholder has a role in

promoting AST. These sources indicate which stakeholders might credibly be approached to contribute to delivery of initiatives to promote AST, and were found in the published literature only.

- In five grey-literature sources, stakeholders were **named as being relevant to promoting AST**. These sources indicate which stakeholders have already been identified by UK bodies as having some role to play in promoting AST.

Of these, the eight sources that undertook problem analyses and the five sources in which stakeholders were named were most useful for systems map development because they reported both stakeholders and relevant behaviours for each stakeholder group. All other sources identified stakeholders and their potential contributions, but not specific behaviours undertaken by the stakeholders.

Table 1 summarises the stakeholders identified across all sources, and methods of identification.

Table 1, Literature reviews: Sources and methods of stakeholder identification

Source	Aim	Setting	Methods of stakeholder identification			
			Published literature			Grey literature
			Identified through problem analysis	Involved in intervention co-design	Involved in intervention delivery	Could be or have been involved
Published-literature review						
Ahrens & Krumdieck (2026)	Intervention development (AST)	Primary schools, Scotland, UK	x	x	x	
Builung et al (2011) + others	Intervention development (AST)	Primary and secondary schools, Canada	x	x	x	
Ciesla & Macioszek (2022)	Intervention development (AST)	(Did not focus on specific schools/ages), Poland		x		
Corral-Abós et al (2022)	Intervention development (AST)	Primary and secondary schools, Spain	x	x	x	
Henderson et al (2013)	Intervention development (AST)	Primary schools, USA			x	
Hidding et al (2025)	Understanding determinants (cycling)	Secondary schools Five European countries	x			
Hinckson & Badland (2011)	Intervention development (AST)	Primary schools, New Zealand		x	x	
Lindqvist & Rutberg (2018)	Intervention development (AST)	Primary schools, Sweden	x		x	
Loitz & Spencer-Cavaliere (2013)	Understanding determinants (cycling)	(Did not focus on specific schools/ages), Canada	x			
McCann et al (2026)	Understanding determinants (AST)	(Did not focus on specific schools/ages), Wales, UK	x			

Source	Aim	Setting	Methods of stakeholder identification			
			Published literature			Grey literature
			<i>Identified through problem analysis</i>	<i>Involved in intervention co-design</i>	<i>Involved in intervention delivery</i>	<i>Could be or have been involved</i>
McDonald et al (2014)	Intervention development (AST)	Primary and secondary schools, USA		x	x	
Whitney & Ledsham (2024)	Intervention development (cycling)	(Did not focus on specific schools/ages), Canada	x	x	x	
Grey-literature review						
Department for Education (2026)						x
Modeshift (2025)						x
Transport for Greater Manchester (2025)						x
Walk Wheel Cycle Trust (2025)						x
Welsh Government (2025)						x

WHAT ARE THE KEY STAKEHOLDERS AND ACTIONS WITHIN ACTIVE SCHOOL TRAVEL SYSTEMS?

Aside from identifying parents/caregivers as crucial for shaping and encouraging AST among children, and teachers as active travel educators – already acknowledged as key stakeholders – the reviewed sources suggested several other stakeholder groups and behaviours that shape the AST system.

Summary of evidence from problem analyses. In these eight sources, the wider school community was portrayed as playing an important role by advocating for active school travel and its promotion. Central government was identified as crucial for developing strategy and transport policy and providing funding. Local government and local authorities were portrayed as playing roles in maintaining infrastructure, such as speed-limit signs or speed bumps. Public health bodies were also suggested to play an active role in leading and publicising AST interventions, alongside third-sector organisations such as charities and advocacy groups. A more extensive account of this information, including barriers to behaviour change, is in **Appendix A (Supplementary Table 1)**.

Summary of evidence from intervention co-design. Across these seven sources, school leadership – and in one case, school-based psychologists – were reported to have played important roles in intervention design by identifying school-specific challenges and judging the credibility of proposed strategies. Local residents were involved in voicing local needs outside of the school context, and one study used ‘community animators’ – i.e., stakeholders recruited to champion AST and connect local residents and schools – to motivate and represent the local community. Local government and local authorities, including departments of health, education, and highways, attended co-design meetings, providing funding, and introducing AST supportive legislation. Public health professionals and the police also participated on committees to develop tailored strategies. Travel coordinators, and project coordinators, were also involved in shaping programmes and orchestrating engagement. This information is reported in **Appendix B (Supplementary Table 2)**.

Summary of evidence from intervention delivery. These eight sources suggested that a range of stakeholders can be engaged in execution and management of AST promotion initiatives. School staff have facilitated delivery of AST initiatives by providing route maps, managing volunteer contacts, and integrating AST into educational activities. Parent-teacher associations have contributed by educating parents about AST. School-based travel coordinators have ensured that multiple stakeholder groups are considered when school travel initiatives are developed. Local residents have petitioned for environmental changes, and in one study, local churches have provided ‘park and stride’ locations to reduce traffic near school. Central government has provided policy frameworks to promote AST and liveability, while local governments and authorities have installed and maintained physical infrastructure, such as signs and street lights. Engineers and urban designers have contributed by designing speed-reduction devices. Police and enforcement officers have enforced speed and parking restrictions around schools, escorted walking buses, and delivered safety education to children. This information is reported in **Appendix C (Supplementary Table 3)**.

Summary of evidence from grey literature. The five grey-literature sources portrayed parents as potential models of and champions for AST, and schools and teachers as providers of AST education and developers of STPs. Local community groups have been highlighted as advocates for local needs. Central government departments are seen as important in providing policy frameworks, statutory guidance and essential funding. Local authorities are

depicted as leading development and implementation of annual AST strategies, assessing local needs and providing strategic leadership. Many local authority teams are named in these documents. Environmental health teams are tasked with managing air quality, and highway officers with providing route information to permit safe travel. Engineers and urban designers are seen to be responsible for the design and installation of ‘school streets’, with legal teams developing traffic regulations to support these. Police and enforcement officers are suggested to provide safety training and enforce parking and safety initiatives around the school. Providers of national initiatives (e.g., Bikeability, Modeshift) are highlighted for their importance in providing accreditation, resources and AST training programmes. This information is reported in **Appendix D (Supplementary Table 4)**.

Table 2 summarises all stakeholders identified across all sources.



Table 2, Literature reviews: Summary of stakeholders and how they were identified

Stakeholders	Published literature review			Grey literature
	Identified through problem analysis	Involved in intervention co-design	Involved in intervention delivery	
School-based				
Parents/caregivers	X	X	X	X
School community*	X	X	X	
Teachers	X	X	X	
PE teachers			X	
School psychologists		X		
School leadership		X		X
School community* champions	X			
School administrators			X	
Parents and Teacher Association (PTA)			X	
School-based travel coordinator			X	
School travel and road safety officers				X
Local community				
Local residents		X	X	X
Community animators**		X		
Local church			X	
Community groups				X
Central government				
Central government (unspecified)	X	X		
CG: department of education	X			X
CG: department of transport			X	
CG: department of health	X		X	
CG: highways		X		
CG: public health	X			X
Policymakers			X	
Local government				
Local government (unspecified)	X	X	X	

Stakeholders	Published literature review			Grey literature
	Identified through problem analysis	Involved in intervention co-design	Involved in intervention delivery	
Council representatives	x			
LG: health		x	x	
LG: education		x		
LG: intervention delivery team		x		
Local authority				
Local authority (unspecified)	x			x
LA: public health bodies	x			
LA: parking & civic enforcement officers	x		x	x
LA: physical activity and health team		x		
LA: highway officers				x
LA: education officers				x
LA: environmental health				x
LA: urban design/landscape architect				x
LA: tree officers				x
Third sector, charities, NGOs				
Third sector organisations	x			
Partner charities				x
Walk Wheel Cycle Trust Active Travel Officer				x
Accreditation organisation (Modeshift STARS)				x
Administrators				
Project coordinator	x	x		
Travel coordinator		x		
Other				
Public transport providers				x
Cycling equipment retailers				x
Police		x	x	x
Health professionals		x		
Engineers			x	x
Sports technician		x		
Legal teams				x

NB: CG: central government. LA = local authority. LG = local government.

CASE STUDIES

Here we report two case studies, identified via the published-literature review and aligned with a systems-based approach, that illustrate how stakeholders (other than parents/caregivers and children) can be involved in promoting AST.

The first case study illustrates stakeholder involvement from an early stage of developing a new AST intervention. The second focuses on stakeholder involvement at a later stage of the intervention development process. It focuses specifically on the role of one facilitative stakeholder (the ‘community animator’), tasked with coordinating and introducing a broader range of stakeholders into the development and execution of an existing AST intervention.

CASE STUDY 1:

‘SCHOOL RUN TO NET-ZERO’ (AHRENS & KRUMDIECK, 2026)

What was the intervention?

This study reports the design of an intervention for primary school children in rural Scotland, which involved stakeholder involvement and behaviour change throughout (‘School Run to Net Zero’; SRNZ). The intervention was piloted in a primary school of around 300 children in Orkney, rural Scotland. The primary aim was to shift school travel culture among parents and children away from private car use and towards sustainable, net-zero transport modes. This case study illustrates how identifying and involving stakeholders throughout the intervention development process can potentially enrich an AST-promotion initiative.

The intervention involved a four-module curriculum designed to empower children to transition away from car-based travel. The first module focused on the science of climate change and the role of fossil fuels in transport; the second module involved students mapping their school run and researching historical travel modes; the third module taught negotiation and fairness by helping children decide how to share a limited number of car trips; and the fourth phase featured activities such as a ‘fossil-free family fun festival’, temporary closure of the school car park, and creation of a mural envisioning the town in 100 years’ time. The programme also featured a data observatory, where children used tokens to track their weekly travel modes.

How were stakeholders identified?

Stakeholders were identified and recruited through multiple approaches. A ‘stakeholder clinic’ was run by the study authors to invite the local community to express concerns about climate change, and was advertised via a radio interview with the author. In response to this, school children from the target school sent letters to the author expressing concerns about sustainability and pledging to take action. The authors identified inactive travel (i.e., car use) to be the school’s main sustainability issues. Next, the authors ran multiple workshops, with stakeholders from the school (*staff, parents/caregivers, children*), and *local council* and *transport body staff*, to conduct an analysis of the problem of making safe journeys to school. The core issues identified as being at the heart of the problem were the ubiquity of the car, the lack of a mechanism for changing travel behaviour at the school, and ineffectiveness of top-down pressure. Stakeholder identification was further developed through ‘co-design

sprints' and 'stakeholder juries', which involved *school psychologists, council transport staff, and randomly selected local residents*.

How did stakeholders contribute to designing the intervention?

Stakeholders co-designed the SRNZ curriculum to ensure its relevance and practicality. *The principal teacher* ensured the programme aligned with Scotland's 'curriculum for existence'. During the design process, school psychologists and council staff helped test proposed solutions for viability, while a 'stakeholder jury' of parents and experts evaluated the concept's potential impact and fairness before it was piloted. Parents also provided feedback during open days to refine the programme materials.

How did stakeholders contribute to delivering the intervention?

Intervention delivery was primarily led by *teachers*, and a group of *children*, selected by their peers, called the 'Net Zero Heroes'. Teachers integrated the programme into daily lessons and facilitated workshops alongside the *researchers*. The 'Net Zero Heroes' managed the data observatory, led school assemblies, and communicated goals to parents and the local press. Parents supported delivery by participating in 'walk to school' weeks, and by recounting experiences of changing travel patterns during community festivals.

Was the intervention acceptable?

The intervention appeared acceptable to multiple stakeholder groups. A 'stakeholder jury' of 11 randomly selected school children voted to permanently adopt the SRNZ programme. Teachers found that the programme covered curriculum requirements with little additional workload. Most parents were supportive, with most approving or otherwise reporting that they felt encouraged to walk or cycle more due to their children's enthusiasm. Media coverage and the consolidation of the 'Net Zero Heroes' group indicated a cultural shift within the school.

CASE STUDY 2:

COMMUNITY ANIMATORS': AND THE FAMILIES AND EDUCATORS FOR SAFE CYCLING PROJECT (WHITNEY & LEDSHAM, 2024)

What was the intervention?

This study reports the implementation of an overarching AST intervention (the 'Families and Educators for Safe Cycling Project'; FESC) in Toronto, Canada. FESC was a programme focusing on organising, educating and mobilising school communities to support AST infrastructure. FESC was designed to target children, parents/caregivers, teachers, administrators, and school governors. It sought to focus on historically marginalised groups and neighbourhoods outside the city centre, where cycling infrastructure has traditionally been lacking.

The FESC programme focused on planning local infrastructure changes, such as protected cycling lanes on major roads using by children, and training grassroots advocates to champion these changes. The intervention also involved creating and distributing AST-supportive resources, such as a cycling handbook for families, and a practitioner guide for replicating the FESC components.

‘Community animators’ – in this context, AST advocates who worked alongside communities to provide information and empower them – were enrolled into the project to bridge the gap between school communities, and the city planners leading on infrastructural change. Community animation aimed to ensure meaningful, ongoing engagement with local communities and so voice their concerns, rather than consulting only via brief surveys or focus groups.

Who were the stakeholders and how did they contribute?

The overarching FESC project was developed by a partnership of *NGOs* and research *think-tanks*, with *local stakeholders* contributing to advocacy of and planning processes required for local cycling infrastructure. *Trained champions* and *school community* members provided the public support and feedback needed for city planners to move forward with infrastructural modifications such as protected bike lanes.

The *community animators* were hired by the local NGO, and were originally project coordinators, but their role evolved to function as a community animator. Whereas project coordination focuses solely on short-term management of the project, community animators focus on more intensive, longer-term relationship-building and community empowerment. Community animators ‘walk alongside’ the local community, using their creativity to develop inspiring engagement, so building relationships and understanding of their needs.

The community animator contacted *schools*, *parents/caregivers*, *local governors*, and *politicians*, and thereby found project champions – i.e., people with an interest in improving local cycling environments. School communities were selected based on data relating to household income, equity of transport access and availability, and proximity to the city’s planned cycling network.

How were stakeholders involved in delivering the intervention?

Delivery relied on the mentorship and training of the 33 champions, who acted as local leaders within their own neighbourhoods. The community animator supported the champions to deliver educational engagements reaching over 1,000 people. Stakeholders also participated in ‘sidewalk interceptions’ to discuss projects with residents, and wrote letters of support to city councillors.

Was the intervention acceptable?

The intervention was highly acceptable, being viewed as ‘hugely valuable’ by both the community and local authority staff. Exit surveys showed that 98% of participants found the educational events relevant to their advocacy work, and 77% reported an increased interest in making their schools more cycling-friendly. Local authority staff noted that the intervention achieved engagement goals that they had not been able to achieve previously. The project led to a legacy of protected bike lanes that now service 30,000 students.



3.

EXPERT CONSULTATION AND PARTICIPATORY MAPPING

AIMS AND OBJECTIVES

The aim of this work package was to construct a behavioural systems map of AST in Surrey, grounded in insights from the literature review, and developed via two rounds of stakeholder consultation with participatory mapping.

Specific objectives were to:

- conduct two rounds of co-design workshops with Surrey AST stakeholders
- identify and map the key stakeholders and behaviours within the Surrey AST system
- construct a behavioural systems map that integrates barriers, facilitators and stakeholders that shape, or could promote, AST in Surrey

We constructed the behavioural systems map by first mapping non-behavioural system barriers and facilitators of AST, and second incorporating stakeholders and behaviours into this map.

The mapping process progressed sequentially, across a series of activities centring on two rounds of expert consultation via workshops and interviews (see Figure 1), using participatory mapping approaches where possible. We present the methods for each of these activities in turn.

A total of thirty people took part in the expert consultation elements.

METHODS

Construction of a baseline systems map

Prior to the first expert consultation round, we generated a baseline, non-behaviour-focused systems map listing system barriers as a starting point for discussion in the expert consultation sessions. Emergent insights from the ongoing literature review regarding some of the system barriers and facilitators of AST were extracted by AR-S. These were synthesised, together with insights from our Phase 1 report (Gardner et al., 2025), by VS and SS-B, to create a preliminary systems map (Systems Map v1; available for download from the Open Science Framework, see <https://osf.io/za2wb>).

This pre-work was used only as a starting point, to make the most of workshop time and to give participants something concrete to which to react, as recommended in existing guidance (CECAN, 2020; Penn & Barbrook-Johnson, 2019). A subsequent iteration of this map, developed following the first round of expert consultation, is described below.

Table 3, Expert consultation: Participating organisations

<i>Stakeholder organisation</i>	<i>Workshop 1*</i>	<i>Post-workshop 1 interview</i>	<i>Workshop 2*</i>	<i>Post-workshop 2 interview*</i>
Departments or agencies within Surrey County Council				
Active Surrey – participant 1	In-person	-	In-person	-
Active Surrey – participant 2	In-person	-	In-person	-
Active Surrey – participant 3	-	Yes	-	Yes
Cabinet	-	Yes	-	Yes
Children, Families and Lifelong Learning – participant 1	Online	-	Online	-
Children, Families and Lifelong Learning – participant 2	No	-	Online	-
Children, Families and Lifelong Learning – participant 3	Online	-	Online	-
Highways Team	No	-	Online	-
Parking enforcement – participant 1	In-person	-	Online	-
Parking enforcement – participant 2	In-person	-	In-person	-
Planning team	In-person	-	In-person	-
Road Safety & Sustainable School Travel	No	-	In-person	-
Safer Travel Team – participant 1	Online	-	Online	-
Safer Travel Team – participant 2	Online	-	Online	-
Safer Travel Team – participant 3	Online	-	Online	-
School engagement	In-person	-	No	-
Surrey County Council (no team specified) – participant 1	In-person	-	No	-
Surrey County Council (no team specified) – participant 2	In-person	-	In-person	-
Surrey County Council (no team specified) – participant 3	-	Yes	-	No
Surrey County Council (no team specified) – participant 4	-	Yes	-	Yes

<i>Stakeholder organisation</i>	<i>Workshop 1*</i>	<i>Post-workshop 1 interview</i>	<i>Workshop 2*</i>	<i>Post-workshop 2 interview*</i>
Departments or agencies within Surrey County Council				
Surrey County Council (no team specified) – participant 5	-	Yes	-	Yes
Surrey County Council (no team specified) – participant 6	-	Yes	-	Yes
Surrey Roadsafe – participant 1	-	Yes	-	Yes
Surrey Roadsafe – participant 2	-	Yes	-	Yes
Surrey Fire & Rescue	In-person	-	In-person	-
External organisations				
Active Travel England	Online	-	No	-
Walk Wheel Cycle Trust – participant 1	Online	-	Online	-
Walk Wheel Cycle Trust – participant 2	-	Yes		Yes
School				
General public (parent)	No	-	Online	-
Infants school	Online	-	No	-

First round of expert consultation

In the first expert consultation round we used a ‘participatory systems mapping’ approach to combine local knowledge with evidence from the literature review. Participatory systems mapping is a workshop-based approach in which stakeholders jointly identify the key factors in a system and draw out how these factors influence one another (Barbrook-Johnson & Penn, 2022; Penn & Barbrook-Johnson, 2019). It is increasingly used in local government and policy settings to explore complex issues where many organisations, behaviours and environments interact, such as transport, health and education (Barbrook-Johnson and Penn, 2021).

Individual interviews were run after the workshop to gather views from stakeholders unable to attend the workshop. **Table 3** provides an overview of participants in the expert consultation process.

WORKSHOP 1:

The first workshop, run to co-create a systems map of barriers and facilitators, and a list of stakeholders and behaviours for inclusion in a subsequent behavioural map, was attended by 17 participants from Surrey County Council, external organisations, and schools. Attendees were identified via a list of 78 stakeholders compiled by Surrey County Council.

The workshop, which was delivered in a hybrid format, followed participatory mapping guidelines and involved four key stages (CECAN, 2020; Penn & Barbrook-Johnson, 2019).

Defining the central problem. Participants refined the draft problem statement – “How to encourage children to use active travel modes to get to school?” – and agreed final wording of the central problem, to sit at the centre of the map.

Identifying system factors. The group next identified key influences – such as transport infrastructure, school policies, and social norms – on the central problem. For each factor, participants also discussed which stakeholders and behaviours were most relevant.

Building a systems map. Participants then mapped connections between factors and the central problem, indicating positive, negative or uncertain relationships between each. Facilitators also helped the group identify feedback loops, where changes in one part of the system eventually feedback to influence earlier factors (Barbrook-Johnson & Penn, 2022).

Reviewing the map. The draft map was refined to ensure it captured critical influences and identified priority areas for change.

POST-WORKSHOP 1 INTERVIEWS

To broaden participation, semi-structured interviews were conducted with 10 stakeholders unable to attend the first workshop. Interviews, which lasted 30-35mins, followed an interview guide that mirrored core areas from the workshop, allowing participants to describe local barriers and validate the systems map. This process functioned as a form of validation, helping to test and strengthen the credibility of the map by feeding in additional expert and practitioner perspectives (Birt et al., 2016).

Constructing a non-behavioural systems map and list of behaviours and stakeholders

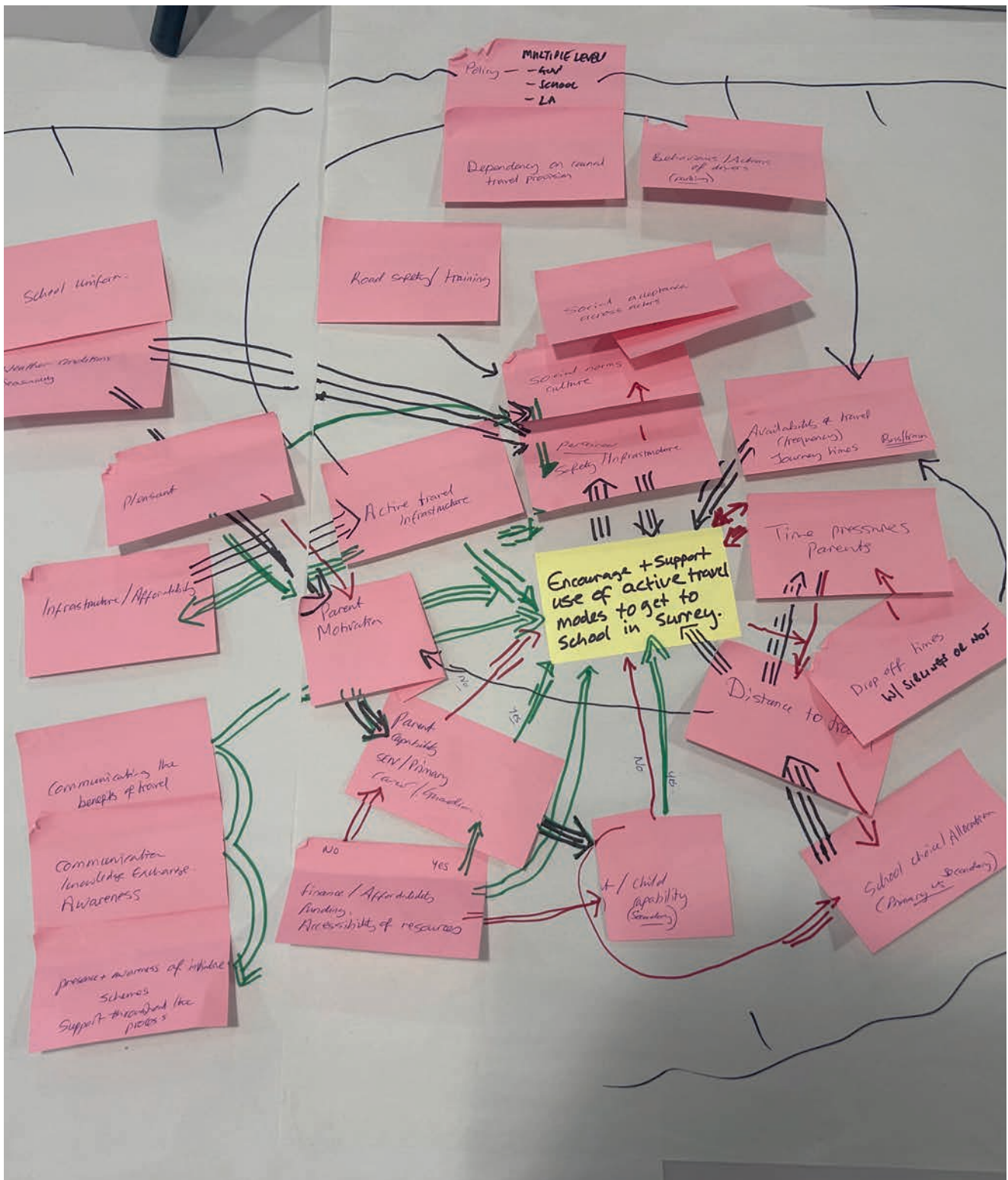
Workshop and interview data were audio-recorded, transcribed verbatim, and thematically analysed (Braun & Clarke, 2021). Analyses of transcripts resulted in a (non-behavioural) systems map (Systems Map v2), digitised using PRSM online software. The systems map, and findings from a thematic analysis surrounding the map, are presented in Section 4.

Transcripts from the first round of expert consultation were also coded for which behaviours and stakeholders were identified as situated in the Surrey AST system. These were then combined with the behaviours and stakeholders identified via the literature review (Table 2), and inductively categorised. This produced a categorised list of behaviours and stakeholders potentially situated within the Surrey AST system (List of Behaviours and Stakeholders v1; see <https://osf.io/za2wb>.)

Both System Map v2 and List of Behaviours and Stakeholders v1 were used to spark discussions in the second round of expert consultation.

Second round of expert consultation

In the second workshop, which was delivered in a hybrid format and attended by 17 participants, we first presented the systems map (v2) for expert verification. Next, participants were given the list of stakeholders and behaviours (v1) for review via discussion. The group was asked to consider whether the map incorporated and adequately described key behaviours that could realistically be targeted, and to suggest additional stakeholders or behaviours where necessary. Finally, participants were asked to recommend strategies for behaviour change among stakeholders. The second round of semi-structured interviews, conducted among eight participants, mirrored this procedure.



4.

A BEHAVIOURAL SYSTEMS MAP OF ACTIVE SCHOOL TRAVEL IN SURREY

Our behavioural systems map was developed using a layered approach, whereby we (a) constructed a non-behavioural map, concentrating on barriers and facilitators of AST in Surrey, (b) generated a list of behaviours and stakeholders for inclusion in a behavioural systems map, and (c) layered the behaviours and stakeholders on to the systems map, so generating an overarching, behavioural systems map. Each of these three components is a standalone, key output, described in detail below.

4.1

KEY OUTPUT 1: A SYSTEMS MAP OF BARRIERS AND FACILITATORS TO ACTIVE SCHOOL TRAVEL IN SURREY

The first round of expert consultation produced a dense map of the factors shaping AST in Surrey, which was subsequently validated by stakeholders in the second round of expert consultation. The map is presented in Figure 2; a zoomable version can be downloaded from <https://osf.io/za2wb>.

This map can be used as a standalone resource, to understand key barriers and facilitators to AST in Surrey, and to target initiatives to promote AST uptake.

Perceived safety and pleasantness of the route, which captured perceptions as much as objective risk or aesthetics, formed a third key cluster (*“if [AST] perceived as safe, you’re more likely to do it”*; WP10, online). Participants drew explicit links between traffic levels, driver behaviour, crossing design and parents’ willingness to allow children to walk, wheel or cycle. Others connected weather and safety, noting that when it is wet *“people are less likely to cycle... people just tend to jump in their car without thinking, because everyone else is”* (WP13, online).

Child capabilities, confidence and influence

Child level capabilities and confidence were widely discussed as shaping both actual and perceived feasibility of active travel, though participants were keen not to portray capability simply as a characteristic of parents/caregivers and children: *“There’s a risk that we describe individuals as not having capability... rather than [being] disabled by their environment”* (WP12, online). This led to more specific nodes around skills for walking, wheeling and especially cycling.

Uneven access to training initiatives emerged as an important sub theme. One online participant explained that while Bikeability provision is valuable, *“you do need to be able to cycle to access Bikeability ... some schools have them, some schools don’t”* (WP12, online). Capabilities were linked to perceived distance (i.e., what constitutes a subjectively ‘manageable’ journey), perceived safety (e.g. confidence crossing roads) and the likelihood of choosing active modes.

Child confidence was also mapped as influencing parents/caregivers and wider social norms. Participants described children’s enthusiasm for walking or cycling as a form of *“pester power”*: *“they go home and then pester the parents. It’s about [children] being the extrinsic motivator to do something more intrinsically afterwards”* (WP9, online). Another emphasised that as children’s confidence increases, *“the bigger influence they have on their parents to act”* (WP10, online). These influences were connected to parental attitudes, time pressure and the formation of new habits. Interviews highlighted modality and age specific capability issues, especially for cycling, with one interviewee stressing that while most children within a mile *“probably can walk to school”*, the barriers to cycling are *“much bigger”*, including bike quality, storage, safe routes and skills (IP7). They also noted a marked *“gender gap in cycling”*, with participation dropping steeply among teenage girls due to issues such as body confidence and uncomfortable uniforms.

Parent/caregiver attitudes, habits, norms and resources

Attitudes among parents/caregivers to risk, perceptions of child independence and existing routines formed a prominent cluster. Travel mode choices were seen as habitual, leading many parents/caregivers to persistently drive without considering other modes: *“Once people get into the habit of travelling to school in a certain way, it’s quite tricky to break it”* (WP11, online). While the term ‘habit’ implies a characteristic of parents/caregivers or children, participants felt that individual routines were embedded in local cultures of mobility.

Affordability and practical resources were viewed as both barriers and potential enablers. Cost was seen as an important driver of change (*“Cost is also one of the major reasons to adopt active travel... that could go almost directly into enabling parents and/or children to commute”*; WP12, online), though participants noted the lack of salience of the ‘hidden’ costs of running a car (e.g., yearly insurance and MOT) versus the more salient, upfront costs of bikes, scooters and clothing. Some felt that the cost savings of active travel could be better emphasised to parents/caregivers: *“If the child’s actively travelling to school... potentially if*

they're not fuelling their car, [parents/caregivers] might be able to save money on that as well" (WP3, in person).

Knowledge of AST routes, options, and initiatives were additional parent/caregiver factors (*"awareness of schemes and the information and guidance being available [is crucial]"*; WP3, in person). Another argued that communication about the benefits of active travel should feed into the cultural and habit nodes.

School level culture, resources and infrastructure

School culture and leadership support were mapped as central in shaping the local conditions for active travel. Representing the school perspective, a headteacher participant stated that *"we're very time poor and so you only do the things that you have that sort of statutory requirement to work on"* (WP9, online), which constrained the ability to prioritise active travel work. The same participant linked funding to these constraints, describing Sports Premium Funding as money that schools *"have to prove we're using towards certain things"* (WP9, online), meaning that only some active travel interventions could be justified.

On site infrastructure such as bike parking, shelters and storage for wet clothing was discussed as within school control, in contrast to road design outside the school. One online participant clarified that schools could provide 'infrastructure' in the shape of *"storage of items ... because the school doesn't really have any control of the infrastructure outside the school itself"* (WP10, online). Participants emphasised the importance of monitoring modes of travel and communicating with parents about expectations and options.

School level policies on travel, parking and drop off times were seen as significant levers, with participants suggesting that staggering start and finish times *"could connect the school time and resources"* with parental time pressure (WP15, online). Others linked school policies to dependency on council travel provision - for example, where families had previously used taxis arranged by the local authority.

Participants emphasised that schools had a limited remit, however. One interviewee noted the under recognised role of police and local enforcement in areas such as idling and inconsiderate parking outside schools, where, despite long standing legislation, *"our attempts to get the police to come to the school... were very difficult"* (IP4).

Built environment, transport and policy context

The wider built environment and transport system framed many of these proximal determinants. Weather was repeatedly cited as a major barrier: *"Most of the time the majority [of parents] say weather is the number one barrier that stops you"* (WP10, online). This node was connected to equipment (e.g. need for waterproofs) and storage at school, as well as to perceived safety and pleasantness of the route.

Transport infrastructure - crossings, junctions, pavement quality, traffic speed and volume, and public transport availability and reliability - formed a dense cluster. One participant noted *"a lot of linkage"* between traffic levels, crossing infrastructure and safety: *"The less traffic there is, the safer the route is, and then the infrastructure is going to help with that as well"* (WP10, online). Another emphasised that if routes are not accessible, *"no matter how close it is - they're not going to be able to travel actively"* (WP15, online).

At the outer edge of the map, policy and political will were drawn as “*umbrella*” factors influencing many nodes. Participants generally felt that “*policy guides it all*” (WP2, in person). Policy was seen as shaping school allocation and distance, council travel provision, funding for infrastructure and schemes, and local authority priorities for road design and enforcement. One participant suggested adding an explicit node for “political will”, noting that although county policies are “*excellent... they’re not being put into effect*” (IP4). They described one cycleway scheme that had strong local support and “was consistent with policy and had more support than opposition” but was still rejected by councillors, illustrating a gap between written policy and implementation.

Participants also spoke of a “*fragmented wider system*”, where responsibilities for transport, education and health sit in different organisations, making coordinated action challenging.

Cross cutting dynamics and perceived complexity

Workshop participants commented on the interconnected nature of the system. Culture and habit, for example, formed cross cutting nodes linking parental behaviour, child influence and school practices. For example, one participant described how time pressure can act as a “pushback” when suggesting behaviour change (WP12, online), while another pointed to “*pester power*” and peer influence as pathways through which children can shift norms (WP9, online).

Interviewees elevated communication and education as central, cross cutting levers rather than just one set of factors among many. One participant argued that “*communication is almost the core point of everything here... Bikeability and training are communication; developing independence is communication between parents and children*” (Interview Participant 11 [IP11]). They felt that “*road safety awareness and communications*” should be linked much more widely across the map, not only to parental capability but also to weather, infrastructure and children’s skills. Another stakeholder emphasised the central role of education for parents/caregivers and children: “*The more we teach and encourage behavioural change - at home and at school - the more likely it is to stick*” (IP11).

4.2

KEY OUTPUT 2: STAKEHOLDERS AND BEHAVIOURS SURROUNDING ACTIVE SCHOOL TRAVEL IN SURREY

The second round of expert consultation produced a list of stakeholders – other than parents/ caregivers and children – and the behaviours that they do (or could do) that influence (or could influence) AST in Surrey. While this was undertaken as a precursor to the development of a behavioural systems map, for clarity we discuss the final list of behaviours and stakeholders (v2; Table 4) separately from the final map. We illustrate these with insights from the second round of expert consultation.

This list can be used as a standalone resource, to identify key stakeholders to target, and which behaviour changes to target among those stakeholders, to inform initiatives to promote AST uptake.

Ten clusters of behaviours were constructed. Three clusters related to the behaviours and stakeholders conducive to adopting a systems-based approach to promote AST in Surrey (i.e., systems-level leadership). The remaining seven clusters related to behaviours and stakeholders deemed conducive to tackling the barriers identified within the systems map (Figure 2).

Table 4, Key Output 2: List of behaviours and stakeholders identified through expert consultation

<i>Behaviour</i>	<i>Stakeholder(s) to target/involve</i>
Cluster: Supporting a systems-based approach	
Prioritise policy and funding to support AST	- Central government - Local authority (health and wellbeing) - Local councillors - Schools - Academics
Use behaviour change frameworks and evidence to design AST initiatives	- Local authority (safer travel, transport policy, active Surrey, public health, health & wellbeing board) - Academics - Schools - Parents/caregivers
Gather evidence to inform AST support	- Local groups (e.g. climate groups, zero-carbon groups, walking/cycling trusts) - Parents/caregivers - Schools/school champions - NGOs - Delivery partners - Local authority - Academics - Peer groups (young people) - National safety bodies
Cluster: Coordinating and involving stakeholders	
Develop, deliver and review coordinated AST strategy	- Local government - Local authority (unspecified) - Schools - Parents/caregivers - External delivery providers
Coordinate collaboration between AST stakeholders	- Local authority (Active Surrey, assessment, safe travel, highways, transport policy) - Schools - Environmental groups
Consult with local community to understand their needs	- Local authority (unspecified) - External delivery providers - Schools

<i>Behaviour</i>	<i>Stakeholder(s) to target/involve</i>
Provide access to data and expertise to support stakeholder involvement in AST promotion	- Local authority (local bus team, school travel & assessment team, safer travel team, web & digital team) - Schools - Academics
<i>Cluster: Evaluating active travel initiatives</i>	
Regularly monitor school travel modes	- Schools - Local authority (road safety team, travel team, Surrey survey teams) - Parents/caregivers
Monitor indices of safe AST	- Local authority (clean air, transport alliance) - Schools - Environmental groups
<i>Cluster: Communicating options to the school community</i>	
Raise awareness of AST initiatives among parents/caregivers	- Local authority (unspecified) - Schools - Local champions - External delivery providers - Local residents
Communicate prioritisation of AST to local residents	- Local authority (unspecified) - Schools - Local champions - External delivery providers
Allocate school staff worktime to AST promotion	- Local authority (unspecified) - Schools
<i>Cluster: Policy and practical support</i>	
Consider travel mode choice in new developments	- Local authority (transport planning team) - Private developers
Support registration for AST accreditation	- Local authority (safer travel team) - Schools
<i>Cluster: Availability and accessibility</i>	
Consider AST implications when changing school day timing	- Local authority (local bus team, travel & assessment team) - Schools
Provide signposting to free school travel assessment	- Local authority - Transport providers - Parents/caregivers - Local champions
Provide AST equipment to school community	- Local authority (unspecified) - Charities - Walking/cycling organisations - Schools

<i>Behaviour</i>	<i>Stakeholder(s) to target/involve</i>
Provide no-cost parking, away from school, around school times	- Car park operators (e.g., local shops/retailers, churches, leisure centres, public parks)
Provide storage and parking facilities and equipment during school day	- Schools - Local authority (safer travel) - Walking/cycling organisations - Local residents/community
<i>Cluster: Knowledge and education</i>	
Allow AST-suitable uniform	- Schools - Parents - Uniform suppliers/retailers
Offer themed activities to promote AST	- School community - Walking/cycling organisations - Local authority (active travel teams) - Active Travel England (and other governing bodies) - Parents/caregivers - Local businesses (as potential sponsors)
Provide AST route maps	- Schools - Local authority (unspecified)
Discuss AST options with parents/caregivers	- Schools - Local authority (web & digital signposting)
<i>Cluster: Supporting skills for active travel</i>	
Deliver AST education or training, at optimal moments	- Local authority (active travel team) - Schools - Walking/cycling organisations - Parents - Local champions
Incorporate AST education or training into classroom activities	- Schools - Police/fire brigade - Walking/cycling organisations (e.g., Bikeability team) - Local authority (active/safer travel team)
<i>Cluster: Physical environment and safety</i>	
Provide adequate lighting and CCTV on AST routes	- Local authority (highways, data protection & GDPR teams) - Central government - Developers - Local businesses
Report inadequate AST routes	- Parents/caregivers - Local businesses
Maintain built-environment infrastructure	- Local authority (passenger transport projects) - Landowners - Developers - Local residents - Highways/cycle route teams

<i>Behaviour</i>	<i>Stakeholder(s) to target/involve</i>
Provide school crossing staff	- Local authority (safer travel teams) - Schools - School community - Local residents
Create traffic calming restrictions around school	- Local authority (developers, highways, regulatory teams, safer travel team, transport development, planning) - Urban designers - Local community (residents) - Parent volunteers - Local businesses - School staff
Enforce driver restrictions around school	- Police - Local authority (civil enforcement officers, parking team) - Local community (residents) - Schools - Parents
Cluster: Parental time pressure	
Provide flexible working	- Employers - Central government - Unions
Enable earlier drop-off and later pick-up	- Local authority (unspecified) - School community - Schools - Parents/caregivers - Community groups/centres - Central government
Provide walking buses	- Schools - Parents/caregivers - Local authority (safer travel, Feet First)
Coordinate car-sharing between parents/caregivers	- Schools - Parents/caregivers

Behaviours and stakeholders conducive to systems-level leadership

Supporting a systems-based approach

This cluster emphasises the importance of changing behaviour to prioritise the policy, funding, and use of frameworks and evidence to adopt a systems-based approach to AST. The cluster focuses mostly on high-level stakeholders such as government and academics, while also highlighting how local authorities and school champions can gather supporting evidence. Participants recognised the need for systems leadership: *“If children are not walking to school, that is the system leaders' issues, because we are the ones forming the systems”* (IP1).

Participants strongly endorsed this cluster (*“policy is fundamental, it influences every single element of the system”*; WP2). Decisions around whether a school can allocate staff time or budget to AST work were framed as ‘a policy/funding issue’ (WP4).

Participants felt that *“councils and politicians are crucial”* (IP5), but a lack of political will has constrained implementation of effective policy: *“The policies are all there ... but it’s not being implemented. ‘Stick’ interventions are difficult for councillors to be seen to be supporting”*; IP4). Another argued that *“... at some point [politicians] have to make hard decisions and implement changes despite some objections, especially when all the evidence shows that in the long run it will save money through better public health and improved air quality.”* (IP5)

While this cluster focused on high-level stakeholders, participants were keen to ensure that schools are not depicted as merely subservient: *“the school communities should have a voice in terms of what they need, rather than us [system leaders] pointing to a model and telling them what’s right”* (WP9). This speaks to the importance of participatory design.

Coordinating and involving stakeholders

This cluster highlights the need to coordinate AST strategy and collaboration among a broad range of AST stakeholders. It involves local government, external providers, and academics working together to consult local communities and share data and expertise to support stakeholder involvement.

Participants agreed that *‘a coordinated strategy is key’* (WP3), and noted the complexity of current governance structures in Surrey, with *“the county, the district and borough ... all deciding different parts of [travel mode provisions]”* (IP5). Participants emphasised the importance of finding, empowering and supporting a dedicated school-based AST champion (*“one person within the school who’s really enthusiastic”*; WP9). They felt that agreeing and allocating responsibilities to stakeholders was a foundational behaviour:

“ That is the fundamental part of building the collaborative network that can actually deliver. [...] If you can trust some of those other stakeholders as key delivery partners, then you can create the social norming, rather than it just coming top-down from the council. ”

(IP5)

Evaluating active travel initiatives

This cluster focuses on the ongoing monitoring of school travel modes and AST safety. Key actors, including local authority survey teams, road safety teams and environmental groups, can ensure that AST initiatives are regularly assessed for effectiveness.

Participants welcomed the identification of stakeholders other than schools as key actors in monitoring and evaluation. This was seen to not only shift the emphasis away from what were felt to be under-resourced schools (*“some schools are not equipped to consider active travel ... because they don’t have the resources to do so”*; IP9), but also highlighted the role of other stakeholders (*“we need approaches that don’t put the whole burden [for monitoring] on schools ... we need local authority or other infrastructure, systems and platforms that reliably capture the numbers”*; WP1).

Behaviours and stakeholders conducive to tackling AST barriers

Communicating options to the school community

This cluster centres on changing behaviour to raise awareness of initiatives, and the prioritisation of AST communication to parents and local residents. Key stakeholders identified were local authorities, schools and local champions (i.e., those “*who can help spread the word and support what schools are trying to do*”; WP6).

Participants felt that some of the communication could focus not only on AST, but also on encouraging more AST-supportive behaviour from drivers (“*give [cycling children] a wide berth, slow down, treat them as if they’re a loved one rather than a ‘pain’ who’s stopping your journey from being as quick as possible*”; IP4).

Policy and practical support

This cluster addresses the strategic planning behaviours needed to support AST: considering travel mode choices in new developments and supporting schools to achieve AST accreditation. This is seen to require behaviour change among – and collaboration between – transport planning teams, the safer travel team, and private developers.

Participants agreed that developers were key, often overlooked stakeholders (“*many new schemes come from them*”; WP6).

Availability and accessibility

This cluster comprises behaviour changes needed for practical logistics, such as providing AST equipment and infrastructure (e.g., bicycle storage), offering no-cost off-site parking at local organisations to allow ‘park and stride’, and considering the impact of school day timings on transport. Stakeholders range from car park operators to charities and school travel assessment teams.

Participants appreciated the focus on promoting behaviour changes and stakeholders across a wider geographical region than immediately outside of school:

“ There’s often a focus around a certain circumference around the school, as if the whole school community lived within 500 metres. It’s not just those 500 metres that we need to look at; we need to look at the whole school journey. ”

(IP04)

Knowledge and education

This cluster focuses on encouraging stakeholders to provide themed AST activities, provide route maps, and ensure school policies – such as uniform requirements – are suitable for AST. This is facilitated by targeting change among the wider school community, uniform suppliers, and national bodies such as Active Travel England.

Supporting skills for active travel

This cluster targets the capability of children and parents/caregivers, through training and education. This is facilitated by schools and local authorities in partnership with training organisations (e.g., Bikeability) and the emergency services.

Physical environment and safety

This extensive cluster encompasses promoting behaviour changes to maintain infrastructure, create safe and well-lit environments, support traffic calming, and enforce driver restrictions. A broad range of stakeholders are implicated, including highways teams, police, urban designers and local residents.

Participants felt that behaviour changes focused on enhancing safety were key:

“ It doesn’t matter how much of the other stuff you do, if the parent doesn’t feel the area is safe for walking, scooting, [or] cycling, no amount of road safety education and motivation will overcome that.”

(Unidentified WP)

Parental time pressure

This cluster focuses on behaviour changes that permit flexible working, provide practical solutions such as walking buses and coordination of car-sharing, and extended drop-off or pick-up hours. While this cluster focuses predominantly on behaviour change among the school community, participants were keen to ensure that external partners were identified as providing resources, and that parents play a role in building capacity (e.g., by running walking buses).

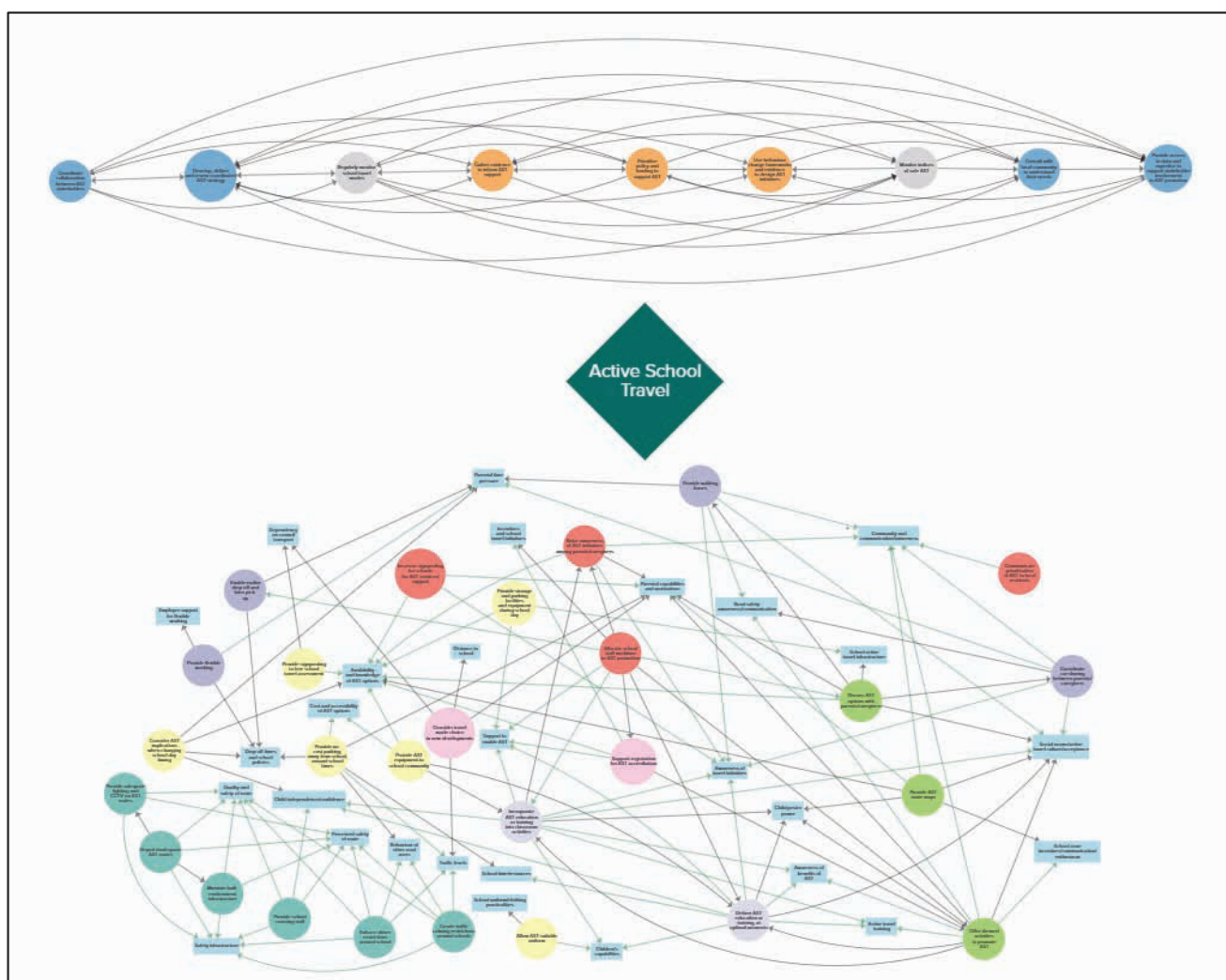
4.3

KEY OUTPUT 3: AN INTEGRATED, BEHAVIOURAL SYSTEMS MAP OF ACTIVE SCHOOL TRAVEL IN SURREY

The final behavioural systems map, generated by incorporating the final list of behaviours and stakeholders (v2) into the final non-behavioural systems map (v2), is available on the Kumu website: <https://tinyurl.com/surreyastbhvrlmap>. **Figure 3** presents a screengrab of the map for illustration purposes, but for full functionality it must be accessed online.

Figure 3, Key Output 3: Screengrab of the behavioural systems map of AST in Surrey

This map can be used as a comprehensive resource, to identify which key stakeholders to target, the behaviour changes to target among those stakeholders, and the system barriers that may lead such changes to promote AST uptake.



How to navigate and interpret the map

Layout

The map is organised into ‘zones’. One zone, depicted at the top of the map, focuses on the behaviours and stakeholders necessary for systems-level leadership of AST promotion initiatives. Within this zone are three colour-coded clusters of behaviours, corresponding to the clusters from the List of Behaviours and Stakeholders (Section 4.2):

- Supporting a systems-based approach
- Coordinating and involving stakeholders
- Evaluating active travel initiatives

The second zone focuses on the behaviours and stakeholders surrounding AST itself, together with barriers and facilitators (i.e., ‘factors’) from Systems Map v2 (Section 4.1). The second zone contains seven colour-coded clusters of behaviours:

- Communicating options to the school community
- Policy and practical support
- Availability and accessibility
- Knowledge and education
- Supporting skills for active travel
- Physical environment and safety

The second zone contains connections between the behaviours and factors (i.e., barriers or facilitators) that would be expected to act as mechanisms for modifying AST. For example, ‘providing walking buses’, a behaviour change that could be made by schools, parents/ caregivers, and the local authority, is expected to increase ‘awareness of travel initiatives’, ‘community and communication’, ‘road safety awareness and communication’, and ‘social norms, active travel culture or acceptance’, and thereby increase AST.

Note that the colour-coding scheme in the final behavioural systems map differs from that used in System Map v2 solely due to differences in default settings on the software packages to construct the maps.

Relationships

In the map, green arrows depict expected positive causal relationships, and black lines capture non-causal relationships, or relationships that could be either positively or negatively causal.

Interactivity

The map is multi-layered and interactive. Users should click on individual behaviours to reveal the specific stakeholders for whom the behaviour is most relevant, and to more clearly identify the relationship between this behaviour and other factors within the map.

For example, clicking on the behaviour ‘Provide walking buses’ reveals that the stakeholders who could enact this behaviour are ‘schools’, ‘parents/caregivers’, and the ‘local authority’. It also reveals that this behaviour is clustered into the ‘parental time pressure’ theme (**Figure 3a**).

Figure 3a: Screenshot of map after clicking 'Provide walking buses'



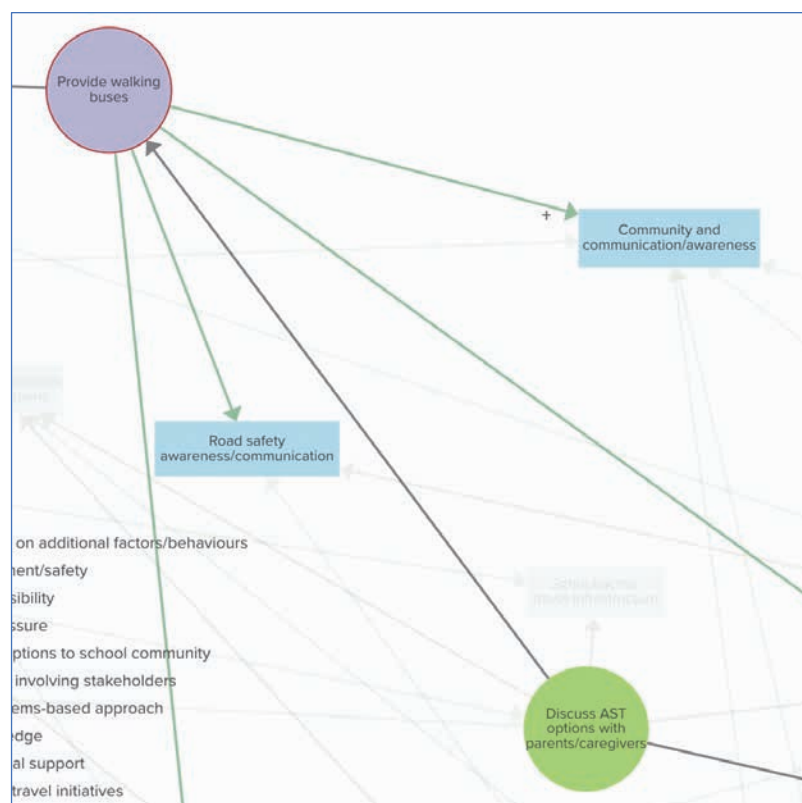
Understanding causality within the map

The map not only lists behaviours and stakeholders, but also, in the second zone, the mechanisms through which changing a specific behaviour would be expected to filter through to changes in AST.

Hovering over a behaviour within the map for 2 seconds highlights the nodes most closely related to this behaviour. For example, hovering over 'Provide walking buses' reveals that this is expected to increase AST by, for example, increasing 'road safety awareness and communication' and 'awareness of travel initiatives' (see **Figure 3b**).

The map can therefore be used to show the pathways through which successfully changing behaviours within the system should filter through to changes elsewhere in the system, and ultimately to increased AST engagement.

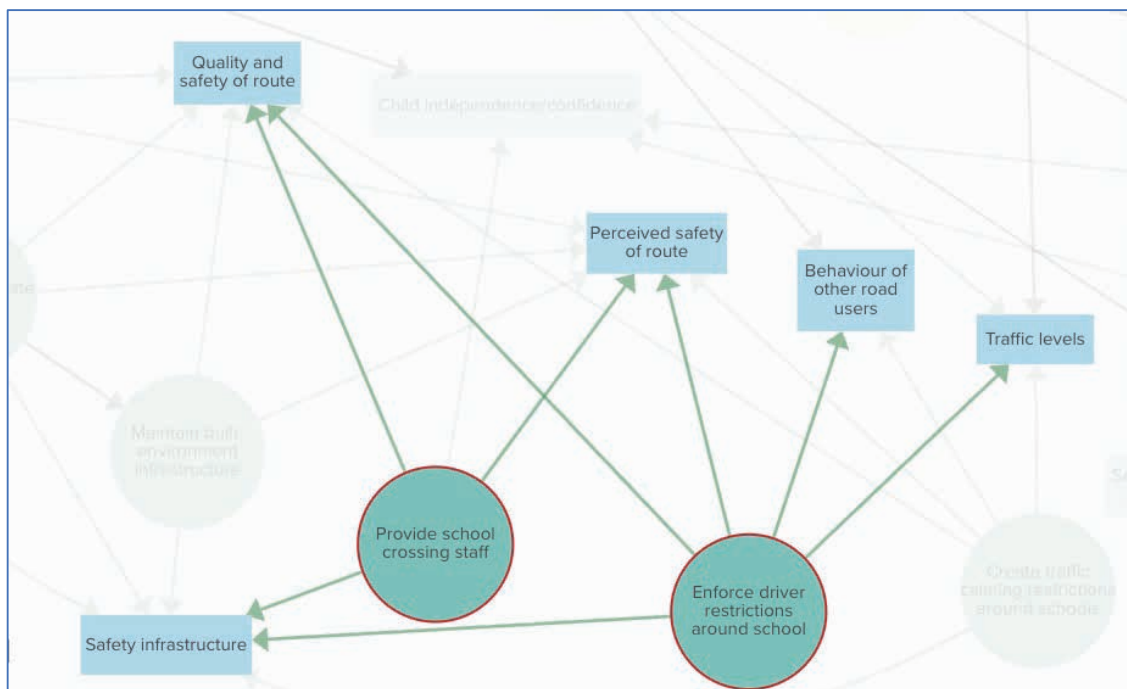
Figure 3b. Screenshot of map after hovering over 'Provide walking buses'



Identifying leverage points

By linking behaviour changes to system barriers, our map offers some preliminary guidance on which behaviour changes could have most impact on system barriers. In particular, behaviours in the ‘physical environment and safety’ cluster appear promising change targets, because several behaviours within the cluster link to multiple barriers. For example, ‘Enforcing driver restrictions around school’ is expected to increase ‘safety infrastructure’, the ‘quality and safety of the route’ and ‘perceived safety of the route’, and the ‘behaviour of others’, and improve (i.e., decrease) ‘traffic levels’. **(See Figure 3c.)**

Figure 3c. Screenshot of map when clicking on 'Enforce driver restrictions around school'



Applying the map to design AST initiatives

This map can be used as the basis for future AST initiatives.

Example: Behavioural diagnosis

The map can be used to identify which behaviour should be changed to enable AST, among whom the behaviour should be changed, and the barriers to changing it.

To use the map for behavioural diagnoses:

- Step 1:** select a target behaviour (e.g., ‘enforce driver restrictions around school’).
- Step 2:** click on the target behaviour to identify relevant stakeholders (e.g., ‘police/fire brigade’, ‘local authority’, ‘local residents/community’, ‘schools’, ‘parents/caregivers’).
- Step 3:** select which stakeholder(s) to target.
- Step 4:** moving away from the map, use the COM-B Model (not part of the map) and available evidence to categorise the potential capability, opportunity or motivational barriers to engaging in that behaviour among the chosen stakeholder(s).

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- Step 3:** select which stakeholder(s) to target.
- Step 4:** moving away from the map, use the COM-B Model (not part of the map) and available evidence to categorise the potential capability, opportunity or motivational barriers to engaging in that behaviour among the chosen stakeholder(s).
- Step 5:** develop initiatives to target changes in the COM-B components.

Example: stakeholder engagement

The map may also be used to identify stakeholders to collaborate with to promote AST. For example, if a lack of ‘policy and practical support’ is thought to be the primary barrier, the user could select behaviours linked to this cluster (e.g., ‘support registration for AST accreditation’), and identify the stakeholders who might make this change (‘local authority’, ‘schools’). The map suggests that this would increase ‘availability and knowledge of AST options’ and improve the ‘incentives and school travel initiatives’, which in turn should filter through to increased AST uptake.

To use the map for stakeholder engagement:

Step 1: identify the main system barrier(s) (i.e., factor[s]) to AST uptake) – for example, ‘availability and knowledge of AST options’.

Step 2: select the behaviours linked to this factor – for example, ‘provide AST equipment to school community’.

Step 3: identify and connect with the stakeholders who could change this behaviour – in this case, ‘local authority’, ‘charities’, ‘walking/cycling organisations’, ‘schools’.

Example applications

Behavioural diagnosis

If a school were to identify ‘parental time pressure’ as the most significant barrier to AST (factor), the map suggests they consider targeting the ‘provision of flexible working’ (behaviour), by for example petitioning ‘employers’ and ‘unions’ (stakeholders).

Stakeholder engagement

If an SCC team wanted to ‘offer themed activities to promote AST’, the map suggests the team might collaborate with, for example, ‘Active Travel England’ and/or ‘local businesses’.

5. RECOMMENDATIONS

While it is important to motivate and empower children and their parents/caregivers to engage in AST, enabling AST also requires more system-wide efforts. Our behavioural systems map can be used to identify which behaviour changes can be made, by whom, to support AST. Here, we report two sets of recommendations: one set generated by stakeholders who participated in the second round of expert consultation, and a set of recommendations by the report authors on how to adopt systems-level change to support AST.

EXPERT RECOMMENDATIONS FOR ENABLING ACTIVE SCHOOL TRAVEL IN SURREY

Here we describe recommendations for systems-level change in Surrey, generated by participants in the second round of expert consultation, using the behavioural systems map. We identify the stakeholders named by experts as most relevant, and categorise obstacles to changing these behaviours into capability, opportunity and motivation barriers, in accordance with the COM-B model (Michie et al., 2011).

Recommendation 1: **Create a formal, multi-agency active travel partnership**

Workshop participants proposed creating a working partnership for developing and implement policy and thereby facilitating systemic change. Interviewees echoed the concern that current strategy is not reliably implemented. IP5 reflected that Surrey's Local Transport Plan *"makes some great provisions ... [but] I'm fairly sure that nothing has been done underneath it"*. Creating partnerships was also seen as key to increasing communication, awareness and visibility of AST schemes.

Stakeholders identified

Local authority teams (transport, road safety, public health, planning); Active Travel England; school and academy trust leadership teams; community groups and local residents; transport operators and partners.

COM-B barriers

Capability barriers to creating this partnership included limited knowledge-sharing across teams, organisational fragmentation, and a lack of structured coordination processes (*"at the moment, as a local authority, we have quite a lot of almost disconnected strategies covering transport and health"*; WP5). Concerns were raised that the upcoming separation of Surrey into East and West could worsen fragmentation and cause coordination problems.

Opportunity barriers identified included time and resource constraints (*"those teams [within the local authority] are quite small but deal with the whole of Surrey ... resourcing is a huge barrier"*; WP10), a perceived culture of over-reliance on schools to lead AST activities, and a lack of early engagement from stakeholders (*"it might be a good strategy, but if no one has bought into it during development, [the local authority is] less likely to carry it on"*; WP5).

Motivation barriers included low trust between stakeholders, disillusionment due to a lack of delivery, and insufficient incentives to collaborate.

Specific recommendation

Establish a formal, resourced active travel partnership with a permanent, identifiable lead. Its role would be to coordinate policy and funding bids, keep strategy under review, and act as a single point of contact for schools and delivery partners.

Recommendation 2:

Improve active travel infrastructure and manage traffic on routes to schools and roads around schools

Workshop participants emphasised the importance of modifying infrastructure and environments to facilitate AST. Despite SCC's existing Road Safety Outside Schools policy, whereby school safety is reviewed upon receipt of a request, several participants described prohibitive and unsafe environments, such as a key junction near a school with no allowances for pedestrians (IP4), and drivers mounting pavements outside schools (IP11). Participants emphasised the need to acknowledge the views of local residents and businesses, who may be inconvenienced by traffic-calming measures. From previous highways engineering projects conducted by SCC, the routing of active travel infrastructure has been historically frequently challenged by local residents.

Stakeholders identified

Property developers; local authority teams (planning officers, highways, transport); urban designers; school leadership teams and school staff; parents; local residents; local businesses.

COM-B barriers

Capability barriers to improving infrastructure and traffic management included a lack of integration of active travel considerations within planning and development processes, and limited capability to standardise effective interventions across contexts ("*school projects are always bespoke in one way or another*"; WP7).

Opportunity barriers included structural and environmental constraints, and motivation barriers included a lack of prioritisation of active travel due to competing interests ("*active travel is at the bottom of [developers'] list*"; WP10).

Specific recommendation

Proactively audit existing infrastructure (e.g., crossings, traffic-calming measures) and consider new infrastructure conducive to AST (e.g., school-street schemes and cycle parking), giving priority to locations where conditions are thought to pose greatest safety risks.

Recommendation 3:

Provide more resources to schools and recruit and empower AST champions

Workshop participants recognised the fundamental importance of schools offering AST initiatives but felt that there is a lack of capacity for AST promotion within schools. Interviewees agreed, noting that, in many schools, providing and supporting AST activities relies on volunteers, so is based solely on the enthusiasm of individuals. One participant observed that schools achieving higher Modeshift accreditation did so because they had

greater staff time to dedicate to the accreditation process.

Stakeholders identified

School leadership teams; school staff, including designated active travel leads; school governors; local authority school travel teams; parents; external delivery partners and providers.

COM-B barriers

Capability barriers included limited capacity within schools to allocate staff time to AST activities, or to recruit and train AST champions (*“a lot of [school] staff just don’t really know where to start ... once people are being paid and given space to say ‘here’s why I’m struggling’, [we] can address those barriers”*; IP5).

Opportunity barriers included a lack of dedicated funding, and a lack of formal roles for prioritising and sustaining AST activities (*“without dedicated staff time, [schools] just don’t have the capacity to do this work”*; IP4).

Motivation barriers included a perceived lack of AST leadership within schools, and a lack of prioritisation of AST in schools. A perceived reliance on voluntary efforts to take AST-related action was felt to position AST activities as optional rather than core, so limiting support.

Specific recommendation

Provide additional funding for schools to run more AST activities, allocate school staff time for such activities, and identify and enable local champions (e.g., school staff, parents/caregivers, or local residents) to support such activities.

Recommendation 4: Support elected representatives to make and defend AST-supportive decisions

Workshop participants noted that local politicians were key to local AST support and provision, and felt that they should be empowered and encouraged to make contentious decisions in a constructive way. One suggestion was that an independent board could be convened to gather opinion and share evidence to change the mindset of Surrey residents and so politicians. Interviewees also described political hesitation as a major barrier, with one participant suggesting that the key barrier to AST support is *“local councillors [not feeling able] to put something in place [because] a small minority are very loud on social media”* (IP5).

Stakeholders identified

Elected representatives, including local councillors; local authority teams (policy, transport, public health); community groups; local residents.

COM-B barriers

Participants felt this was mostly a motivational issue, with elected representatives hesitant to take decisions seen as risky, due to the reputational cost of supporting contentious measures, even when evidence supports such measures (*“‘stick’ interventions are difficult for councillors to be seen to be supporting”*; IP4).

The upcoming separation of Surrey into East and West was seen as an important potential

opportunity barrier, as it could lead to fragmentation and a lack of political will.

Specific recommendation

Provide councillors with high-quality, locally relevant evidence to demonstrate demand for and impact of AST, and create cross-party working arrangements to share responsibility for decision-making.

RECOMMENDATIONS FOR PROMOTING SYSTEMS-LEVEL CHANGE

We add three recommendations to those generated by expert stakeholder participants.

Recommendation 5:

Ensure stable sources of funding for systemic AST change

In both rounds of expert consultation, participants identified a lack of dedicated funding as a primary opportunity barrier that undermines AST promotion. This echoes concerns raised in sources from the published-literature review (McCann et al., 2026). Funding is needed to enable long-term success in AST promotion.

We recommend that a steady stream of funding for AST promotion is secured, to cover the activities associated with coordinating and aligning stakeholders for system-level change, as well as expenditure such as the costs of active travel equipment, and the ongoing resource needs of school communities.

Recommendation 6:

Identify a lead organisation and individual to manage multi-sectoral collaboration

The AST system in Surrey is currently perceived as fragmented, with responsibilities split across transport, education, and health strategies, and some perceived disconnection between these. A coordinated strategy is essential to overcome the complex governance structure in Surrey, where boroughs and the county council often make important decisions on different aspects of travel provision.

We recommend the identification of a lead organisation, and a dedicated individual within that organisation, to manage collaboration between stakeholders, and provide a single point of contact for the AST behavioural system. Establishing a formal AST partnership with a permanent, identifiable lead will ensure responsibility for active travel is not diffused across multiple stakeholders and will avoid siloed thinking and acting. The partnership lead must be empowered to coordinate policy, manage funding, and create trust within the network, to drive high-level AST activity across Surrey. This governance structure will need to be sufficiently robust to ensure that progress is not derailed by the upcoming unitary separation.

Recommendation 7:

Ensure that the separation of Surrey County Council into East and West Unitary Authorities does not derail AST promotion activities

Stakeholders expressed significant concern that the separation of Surrey into East and West regions could act as a major opportunity barrier for AST. There is a risk that this shift could worsen existing organisational fragmentation and cause coordination problems between the two regions (*“the worse-case scenario would be not looking at the whole picture as a*

system and [instead] stopping at the East/West boundaries”; WP5). Active travel activities must not become narrowed in scope by new administrative boundaries.

We recommend that system leaders coordinate the AST-relevant activities of the two regions, viewing the county’s travel system as a single entity, to prevent the breakdown of existing active travel partnerships while fostering new ones.

NEXT STEPS

Our Phase 1 report (Gardner et al., 2025) highlighted the need to adopt a systems-based approach to promote AST. In this report, we have mapped out the complex network of stakeholders, behaviours, and other factors that together constitute the ecosystem surrounding AST in Surrey.

Our behavioural map represents a starting point in the development of AST initiatives, useful for spurring action and stimulating further reflection on optimal leverage points within the behavioural system. The logical next step in this work is application: the map should be used as a practical tool to inform decision-making around where to intervene in the system, and with which stakeholders, to enable greater AST engagement among children in Surrey.

LIMITATIONS

This project provides an evidence-based foundation for a systems-based approach to AST in Surrey. However, several limitations must be considered when interpreting and applying our behavioural systems map.

A major limitation of our map is that it does not fully account for important differences in the stakeholders, actions and challenges surrounding AST among primary school children and those among secondary school children. For example, parents/caregivers play a greater, more direct role in travel mode decisions among primary school children than secondary school children, and primary school children are significantly less likely to travel independently. Secondary school children typically have greater autonomy over school travel decisions. This is not adequately reflected in the map because more of the sources considered in the literature review focused on primary school children, and the limited input of school stakeholders in the expert consultation process was provided by a single, infant-school headteacher. This does not invalidate our map, because there are many common barriers to AST engagement among both primary and secondary children (e.g., perceived distance), and common behaviours and stakeholders (e.g., local authorities) influence AST engagement in both groups. To address this limitation and maximise the relevance of our map, more work is needed to prioritise differentiation of map components relevant to primary and secondary school children.

Another significant limitation is that, while we consulted experts to co-create the list of behaviours within the system map, we did not assess the credibility of these behaviours as change targets. Due to resource constraints, we were unable to assess how feasible it would be to change these behaviours, or the potential influence of successfully changing such behaviours on AST. To address this limitation, future work might seek to gauge the extent to which the behaviours in our map can most realistically and impactfully be targeted.

Similarly, while we captured stakeholders identified in previous literature and by SCC and our expert participants, we relied on the participation of those stakeholders who chose to cooperate. Participating stakeholders identified other stakeholders for inclusion in the map, but nonetheless, other influential stakeholder perspectives – such as the police, or local

residents – may not have been adequately represented in this iteration. To address this limitation and represent the system more comprehensively, we recommend developing our map further to incorporate a broader range of stakeholder views.

The behavioural map represents the AST system in Surrey as it stood in Summer 2026. However, behavioural systems are dynamic and inevitably change over time. The recent local government reorganisation which will see Surrey split into East and West administrative boundaries, was of notable concern to participants, who felt it could worsen fragmentation or narrow the geographical scope of AST promotion activities. More broadly, this shift will have a considerable effect on the comprehensiveness of the behavioural map. To overcome this limitation, we recommend that our map is updated periodically, to capture changes in the landscape of relevant stakeholders, and to ensure all relevant stakeholder organisations are represented.

CONCLUSION

This project established an evidence-based behavioural systems map of active school travel (AST) in Surrey, merging insights from previous research and grey literature with the lived experience and professional expertise of local stakeholders. Our map is designed to enable AST promotion work to move beyond a focus on individual parents/caregivers and children, to encompass and target an extensive network of stakeholders and behaviours that collectively shape the school travel ecosystem.

AST is nested within a complex system. Long-term shifts in school travel norms will depend upon structural, systemic enablement. While the current map provides a vital starting point, to maintain its relevance, it must be periodically updated to reflect the changing contributions of stakeholders and the administrative landscape. Increasing AST will require stable, dedicated funding, identifiable systems leadership, and robust multi-sectoral collaboration to ensure that responsibility for AST promotion is shared across a network of stakeholders.

6. ACKNOWLEDGEMENTS

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7. REFERENCES

* References marked with an asterisk were included in the literature review

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**Appendix A, Supplementary Table 1: Published literature review.
Stakeholders, behaviours and barriers identified through problem analyses**

Source	Aim, context, setting	Stakeholders	Behaviours	Barriers to behaviour
Ahrens & Krumdieck (2026)	Intervention: promoting net-zero school travel Primary schools (child age not specified) Scotland	Parents	(Not) using car	- Inconvenience - Reliability concerns - Safety concerns - Car use habits
			Buying an electric vehicle	- Cost
			Allowing child to walk or cycle	- Safety concerns (traffic-related)
			Investing in non-car infrastructure	- Cost
Builung et al (2011) + others	Intervention: promoting AST Primary and secondary schools (9-14 years) Canada	Parents	(Not) using car	- Child age - Distance from school - Lack of supportive infrastructure (e.g., no bicycle racks) - Lack of safety education - Inconvenience - Lack of incentives
			Advocating for the project	- Time commitment - Lack of motivation

Source	Aim, context, setting	Stakeholders	Behaviours	Barriers to behaviour
		Teachers	Delivering education	- Lack of clarity about expected role - Time/workload commitments
			Replacing damaged infrastructure	- Cost/funding
		Local (municipal) government	Modifying infrastructure	- Lack of confidence that this would reduce traffic and/or promote AST
			Implementing engineering changes (e.g., stop signs, speed bumps)	- Lack of confidence that this would reduce traffic and/or promote AST
		Central government – department of education	Developing and implementing transport policies	- Lack of recognition of AST as a form of school transport
		Public health nurse	Leading intervention delivery	- Time commitment
			Publicising intervention/AST	- Time commitment
		Community partner	Enforcing illegal parking	- Expected complaints from parents to school leadership - Expectation that parents will be rude or unhappy

Source	Aim, context, setting	Stakeholders	Behaviours	Barriers to behaviour
Corral-Abós et al (2022)	Intervention: promoting AST Primary and secondary schools (10-12 years) Spain	Parents	Encouraging child to use AST	- Distance - Inconvenience - Parents' own commuting mode - Perceived lack of children interest - Safety concerns - Accessibility concerns - Time commitment
		Teachers	Engaging children in AST	- Perceived difficulty in engaging children - Lack of confidence in encouraging AST - Time/workload commitment - Lack of support from parents/caregivers
Hidding et al (2025)	Understanding determinants: cycling to school/vcf Secondary schools (12-15years) Five European countries	Parents	Encouraging child to cycle	- Perceived lack of child cycling skills/knowledge - Cost of cycling equipment - Safety concerns – traffic - Safety concerns – crime
		Teachers	Encouraging child to cycle	- Lack of supportive infrastructure - Antisocial behaviour of car drivers

Source	Aim, context, setting	Stakeholders	Behaviours	Barriers to behaviour
Lindqvist & Rutberg (2018)	Intervention: promoting AST Primary schools (7-8 years) Sweden	Teachers	Implementing intervention	- Lack of engagement
		Parents	Acting as role models	- Safety concerns – traffic - Safety concerns – crime
Loitz & Spencer-Cavaliere (2013)	Understanding determinants: cycling to school (Did not focus on specific schools/ages) Canada	Parents	(Not) driving to school	- Inconvenience - Accessibility of AST - Car use habit
			Encouraging child to independently travel to school	- Safety concerns – traffic - Safety concerns – crime - Built environment concerns - Perceived lack of child skills/knowledge for cycling - Own poor safety behaviours (e.g. double parking, jaywalking)
		School staff	Encouraging child to use AST	- Time/workload commitment - Lack of financial support

Source	Aim, context, setting	Stakeholders	Behaviours	Barriers to behaviour
McCann et al (2026)	Understanding determinants: AST (Did not focus on specific schools/ages) Wales, UK	Central government	Providing funding	- Prioritisation of research over impact
			Ensuring alignment across organisations and sectors	- Poor communication and coordination - Disconnect between decision-makers and implementers
			Developing frameworks to establish guidance from a high-level perspective	- Lack of structure and planning
		Local government	Providing funding	- Inconsistent availability of funding - Prioritisation of research rather than impact - Unclear which fund(s) to use
			Ensuring alignment across organisations and sectors	- Lack of (knowledge of) shared objectives - Poor communication and coordination - Disconnect between decision-makers and implementers

Source	Aim, context, setting	Stakeholders	Behaviours	Barriers to behaviour
Whitney & Ledsham (2024)			Developing frameworks to establish guidance from a high-level perspective	- Lack of supportive central government policy - Lack of structure and planning
		Local and regional public health bodies	Developing frameworks to establish guidance from a high-level perspective	- Lack of supportive government policy - Lack of structure and planning
		Third sector organisations (e.g., charities, advocacy groups)	Developing frameworks to establish guidance from a high-level perspective	- Lack of supportive government policy - Lack of structure and planning
	Intervention: promoting cycling to school (Did not focus on specific schools/ages) Canada	Project coordinators	Advocating for the project	- Cost - Resources - Bureaucracy

* Whitney and Ledsham (2024, p339) define the 'school community' as 'the parents [and caregivers], teachers, students, administrators, and school board staff/trustees [governors] who form part of the educational ecosystem'. AST = Active school travel.

**Appendix B: Supplementary Table 2, Published-literature review:
Stakeholders involved in intervention co-design**

Source & setting	Intervention focus, setting	Stakeholders	Role played in intervention design
Ahrens & Krumdieck (2026)	Promoting net-zero school travel	School community*	- Judged credibility of potential strategies
	Primary schools	Local residents	- Judged credibility of potential strategies
	Scotland, UK	School psychologists	- Judged credibility of potential strategies
Builing et al (2011) + others	Promoting AST	Parents	- Conducted “hands-up” surveys on children - Participated in a School Travel Plans (STP) committee - Identified and developed potential strategies to tackle school-specific challenges
	Primary and secondary schools	Teachers	- Completed household questionnaire - Participated in a STP committee - Identified and developed potential strategies to tackle school-specific challenges
	Canada	School leadership	- Participated in a STP committee - Identified and developed potential strategies to tackle school-specific challenges
		Local (municipal) government	- Participated in a STP committee - Identified and developed potential strategies to tackle school-specific challenges

Source & setting	Intervention focus, setting	Stakeholders	Role played in intervention design
		Police	- Participated in a STP committee - Identified and developed potential strategies to tackle school-specific challenges
		Health professionals	- Participated in a STP committee - Identified and developed potential strategies to tackle school-specific challenges
Ciesla & Macioszek (2022)	Promoting AST (Did not focus on specific schools/ages) Poland	Parents	- Participated in workshop to identify and classify the actions, policies, and scenarios of AST projects
		Local government	- Participated in workshop to identify and classify the actions, policies, and scenarios of AST projects
Corral-Abós et al (2022)	Promoting AST Primary and secondary schools (10-12 years) Spain	Sports technician	- Attended intervention co-design meetings
		Local government – department of health	- Attended intervention co-design meetings
		Local government – department of education	- Attended intervention co-design meetings
		Teachers	- Attended in-school planning working group meetings
		Parents	- Attended in-school planning working group meetings
		Central government	- Provided funding
Hinckson & Badland (2011)	Promoting AST Primary schools	Local authority	- Provided list of schools to target

Source & setting	Intervention focus, setting	Stakeholders	Role played in intervention design
	New Zealand	Travel coordinator	- Managed the STP programme
McDonald et al. (2014)	Promoting AST 8-14 years USA	Central government - highways	- Introduce AST-supportive legislation - Introduce funding for AST - Plan, develop and implement projects to reduce car traffic and air pollution around schools
Whitney & Ledsham (2024)	Promoting cycling to school (Did not focus on specific schools/ages) Canada	Community animators**	- Connected school communities with urban planners - Engaged with local residents - Advocated for local residents' needs
		City-level intervention delivery team	- Run a safe cycling programme
		School community* champions	- Champion cycling infrastructure projects - Participate in outreach - Advocate for safe cycling - Mobilise other school community members
		Project coordinator (within local NGO)	- Orchestrate engagement - Identify school community and local residents' needs - Train school community champions

* Whitney and Ledsham (2024, p339) define the 'school community' as 'the parents [and caregivers], teachers, students, administrators, and school board staff/trustees [governors] who form part of the educational ecosystem'. ** 'Community animators' are 'individuals who work intimately with local communities to catalyze relationships, provide information, and empower residents over the long term, going above and beyond project coordinator approaches' (Whitney & Ledsham, 2024, p338). AST = Active School Travel. NGO = non-governmental organisation. STP = School Travel Plan.

**Appendix C: Supplementary Table 3, Published-literature review:
Stakeholders involved in intervention delivery**

Source	Intervention focus, setting	Stakeholders	Role in intervention delivery
Ahrens & Krumdieck (2026)	Promoting net-zero school travel Primary schools Scotland, UK	Teachers	- Deliver learning workshops on AST - Run workshops on school travel planning, cycling and pedestrian skills, benefits of AST
Builung et al (2011) + others	Promoting AST Primary and secondary schools Canada	Police	- Deliver education sessions to children
		School administrators	- Provide maps of AST routes
		Parents	- Review child's walking practices - Provide a 'pedestrian permit' card to child able to walk independently to school
		School community*	- Run AST activities and events (e.g., walk to school days, pedometer challenges)
		Local (municipal) government	- Run projects to install and maintain physical infrastructure conducive to AST - Installation of 4-way stops and streetlights - Repair damaged walkways - Provide increased school zone signage
		Civic enforcement officers	- Enforce speed and parking restrictions outside school

Source	Intervention focus, setting	Stakeholders	Role in intervention delivery
Corral-Abós et al (2022)	Promoting AST Primary and secondary schools (10-12 years) Spain	Parents	- Volunteer to run walking school bus to escort children who walk to and from school
		Teachers	- Run walking school bus to escort children who walk to and from school
		Local government (city council)	- Implement secure bicycle parking facilities
		Local government (physical activity and health team)	- Provide staff - Provide funding - Include AST-promotion project in local planning - Develop AST-friendly policies
Henderson et al (2013)	Promoting AST Primary school USA	PE teacher	- Implement pedestrian-safety curriculum
		Parents and Teacher Association (PTA)	- Deliver education to parents on benefits of AST - Provide map of AST routes
		Local church	- Offer 'park and stride' parking spaces to parents
		School administration	- Publish contact details for walking school bus volunteers
		Local residents	- Petition local government requesting changes to built environment.
		Police	- Enforce speed restrictions outside school - Escort walking buses

Source	Intervention focus, setting	Stakeholders	Role in intervention delivery
Hinckson & Badland (2011)	Promoting AST Primary schools New Zealand	Travel coordinator (per school)	- Facilitated action plan that used engineering, education, enforcement, encouragement and policy interventions.
		School community*	- Conduct and/or participate in baseline transport and safety monitoring survey - Implement new policy prohibiting on-site school parking
		Teachers	- Conduct hands-up surveys with children to assess travel modalities to and from school. - Provide road safety education to children
		Engineers	- Modify infrastructural environment through crossings, cycling facilities, speed-reduction devices, road markings and signage.
		Parking officers	- Enforce parking restrictions outside school

Source	Intervention focus, setting	Stakeholders	Role in intervention delivery
Lindqvist & Rutberg (2018)	Promoting AST Primary schools (7-8 years) Sweden	Local residents	- Participate in baseline transport and safety monitoring survey
		Parents	- Attend AST discussion meetings
		Teachers	- Create special weekly assignments - Measure distances for each child's AST - Develop teaching that feeds back AST data to students - Deliver gamified AST measurement - Run AST workshops for children
McDonald et al (2014)	Promoting walking and cycling to school 8-14 years USA	Teachers	- Educate and encourage children
		Police	- Enforce speed and parking restrictions around school
		Local (municipal) government	- Provide and maintain built environment infrastructure
		Central government - department of transport	- Develop policy promoting 'livability' goals
		Central government - department of health	- Develop policy promoting physical activity in children

Source	Intervention focus, setting	Stakeholders	Role in intervention delivery
Whitney & Ledsham (2024)	Promoting cycling to school (Did not focus on specific schools/ages) Canada	Policymakers	- Develop policy promoting safe and accessible environments - Implement policies that encourage AST (e.g., improving infrastructure, traffic safety)
		School staff	- Promote AST initiative - Engage with parents and children - Integrate AST into school programmes
		Parents	- Encourage and support AST among children

* Whitney and Ledsham (2024, p339) define the ‘school community’ as ‘the parents [and caregivers], teachers, students, administrators, and school board staff/trustees [governors] who form part of the educational ecosystem’.

AST = Active School Travel.

Appendix D: Supplementary Table 4, Grey literature review:
Roles that stakeholders could play, or have played, in promoting active school travel

Source	Stakeholders	Behaviours relevant to promoting active school travel
Department for Education (2026)	Local authorities	- Publish yearly SMOTS strategy
	School leadership	- Share information - Consider travel arrangements when making changes to school day
	Providers of national initiatives	- Provide accreditation (e.g., Modeshift stars) - Provide AST training (Bikeability) - Provide Living Streets, School Streets - Provide 'Park and Stride' points - Community cycling hubs
Modeshift (2025)	Local authorities	- Lead development, implementation, and review of AST strategy - Lead in assessing needs, facilities, and services; promoting sustainable travel; and publishing the strategy.
	Local authority departments	- Assess school travel needs and facilities/services for sustainable travel. - Develop and publish strategy with clear vision, objectives, and action plans - Coordinate across departments and with external partners - Monitor and review the strategy, updating as needed
	Neighbouring authorities	- Provide data, expertise, and support for infrastructure, safety, and health initiatives
	Combined authorities	- Provide data, expertise, and support for infrastructure, safety, and health initiatives
	School leadership	- Conduct annual travel surveys and site audits - Develop and implement STPs - Deliver and promote initiatives (e.g., Walk to School Week, cycle training) - Involve children in travel planning and safety assessments.
	Parents/Caregivers	- Respond to surveys and consultations - Support and model sustainable travel behaviours
	Local Residents	- Respond to surveys and consultations - Support and model sustainable travel behaviours
	Public transport providers	- Provide data, expertise, and support for infrastructure, safety, and health initiatives
	Community groups	- Provide data, expertise, and support for infrastructure, safety, and health initiatives

Source	Stakeholders	Behaviours relevant to promoting active school travel
Transport for Greater Manchester (2025)	Local authorities	- Provide strategic leadership - Deliver funding
	Schools and further education	- Implement AST promotion initiatives - Educate children about importance of AST
	Parents/caregivers	- Encourage children to engage in AST - Support AST promotion
	Community groups	- Provide local delivery - Provide advocacy
	Partner charities	- Provide training to intervention deliverers - Run AST-promotion campaigns
	Police	- Provide safety training to children - Enforce safety initiatives
	Bus operators	- Provide bus services
	Central government - department for education	- Develop AST-supportive policy - Provide statutory guidance
	Modeshift STARS	- Provide accreditation - Provide resources
	Cycling equipment retailers	- Provide infrastructure - Provide access
Walk Wheel Cycle Trust (2025)	Walk Wheel Cycle Trust Active Travel Officer	- Provide hands-on support for programmes of activities, inside and outside classroom - Provide schools with skills and knowledge
	Central government - department for public health	- Provide funding
	Engineers/designers	- Design and install School Streets
Welsh Government (2025)	Legal teams	- Process and advertise Traffic Regulation Orders

Source	Stakeholders	Behaviours relevant to promoting active school travel
	Local authority	- Install CCTV cameras
	School travel and road safety officers	- Engage with schools
	Highway officers	- Provide emergency and alternative route information
	Education officers	- Provide strategic/policy support and integration
	Environmental health team	- Manage air quality
	Urban design/landscape architect	- Provide design and installation support
	Tree officers	- Provide design and installation support
	Civic enforcement officers	- Enforce parking restrictions

NB: AST = Active school travel. STP = school travel plan.



