

TRANSPORT INSTITUTE



UCLA



# The Landscape for Transport Research

December 2017

Academic Research Funding, Paradigm Shift, and  
Recommendations for the Research Community

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# SUMMARY

UCL's Transport Institute developed this report in response to upheaval in the transport sector combined with concerns among the UCL community about the future of transport research. We drew on interviews with 20 stakeholders who conduct, commission, or fund research from 12 different institutions, and reviews of our initial draft by these participants plus two additional reviewers. Our aim was to:

- Clarify how transport research is positioned
- Consider how transport research is funded
- Understand the context for academic transport research
- Make initial recommendations for the research community

## **Position of transport research**

Transport research came to a crossroads in 2017, undergoing something of a paradigm shift from 'transport' to 'infrastructure.' The Engineering and Physical Sciences Research Council (EPSRC) removed 'Transport and Operations' as a research area, repackaging the topic of transport into 'Infrastructure and Urban Systems.' The move aligns with government agendas on cities, large scale investment in the UK Collaboratorium for Research on Infrastructures and Cities (UKCRIC), and evidence from the research community. It leaves transport in the position of being the only one of six key areas of infrastructure, including energy, water, transport, ICT, built environment, and health, that does not have a named Research Area at EPSRC.

The research community sees the disadvantages of this shift. Many participants felt that funds for transport research are declining through this shift and a combination of other factors:

- Austerity budgets reducing other research funding, such as from DfT
- Loss of research work under framework agreements
- Research proposals falling into a gap between ESRC and EPSRC
- Well known weaknesses in the proposal review process for cross-disciplinary research
- Potential loss of EU funding

These developments have caused some bumpy adjustment. However, commissioners/funders have told us that research excellence and peer review are the channels that 'decide' funding, and not categories such as designated Research Areas. They have argued that nothing has changed in terms of available funding for transport-related projects.

One reviewer argued that the advantage of not having a designated 'Research Area' is that you are not 'boxed in' by that area. For example as transport is seen as a component of many different 'big ideas,' it may be easier and more natural to leverage these without a Research Area for 'transport.' For example we found that several driving forces have positioned transport research as one smaller piece of several big ideas:

- Climate change and energy: transport as a subset of energy consumption issues
- Economic growth: transport repackaged as ‘technology and innovation’
- Infrastructure and cities: transport as one thread in a large urban tapestry
- Health: transport as one tool among many to contribute to better public health
- Digital economy: transport as but one supplier of the vital data that can grow the economy

### **Cross-Disciplinary Research**

Participants noted that by necessity, most transport research proposals are cross-disciplinary, presenting a number of challenges. Formulating this type of research involves harmonizing language, concepts, and methods from different world views, which adds time and cost. The proposal review process has well known weaknesses. Some participants commented that a number of research proposals fall into a ‘chasm’ between ESRC and EPSRC. It was not clear how much ‘self marginalisation’ was occurring – that is, researchers choosing not to submit transport research proposals that they consider to sit between Research Council remits.

### **Consultancy versus Academic Research**

Although participants said academic research is valued for being cutting edge, rigorous, and independent, academic research is also slow paced and often communicated through inaccessible, specialised language. Participants characterized consultant research as repackaging knowledge on a short timeline. Consultants are more frequently filling research voids where decisions have to be made on

shorter timelines to keep up with technical change. In parallel with this, various measures of excellent research are coming into conflict. University departments value publishing in specialist journals, while Research Councils look more for real world impact. Some participants felt that transport did not fit well into the Research Excellence Framework subpanels.

### **Recommendations**

Is a new paradigm for transport research emerging, and if so, how should the academic research community and its stakeholders respond? We present four recommendations (following page) that describe ways for the community to organize itself to analyse and articulate a view on the paradigm for research, to assess research needs and community membership, and to take short term actions that respond to the immediate context for research. We suggest that in pursuing the recommendations, the research community should be mindful of:

- Understanding the unique way that transport touches peoples’ daily lives
- Balancing the social and behavioural side of research with the technological and commercial side in the socio-technical systems that make up transport, even in times of external pressure toward innovation, technology, and commercialisation
- Encouraging more coordination between agencies and funders dealing with transportation in contemporary ways, for example across modes.

# RECOMMENDATIONS

**R1**

At the broadest level, the transport and mobility research community should organise itself with key stakeholders to assess research needs and the paradigm for academic transportation research. A part of this process will be anticipation of the end of EPSRC's current three-year delivery arc in 2019. The community should come together now to articulate constructive ways for 'transport' research to be articulated within UKRI. For this and the broader process of examining the research paradigm, the community should look to the recent process undertaken for public health on optimising the research environment. In a transport and mobility setting, such a project might be characterized as 'Optimising the research environment for healthy, fair and productive mobility.'

**R2**

Researchers should pursue EPSRC responsive mode. EPSRC expects 60% of its funding to go to responsive mode proposals where success rates are moderate. By contrast ESRC success rates in responsive mode are falling below 20%, which means time may not be well spent applying to ESRC responsive mode.

**R3**

Researchers should make cross-disciplinary excellence more accessible to discipline-focused reviewers to counteract problems in cross-disciplinary work with language, concepts and understanding. Using plain language and respecting frequently time-starved contexts (practice, policy or business) will help academics translate their findings into impact.

**R4**

The research community should explore, with funders and commissioners, new models for academics to meet research needs in fast-paced, real world settings.

# INTRODUCTION

## **Purpose**

The UCL Transport Institute (TI) serves as a hub for the university's researchers working on transport in all eleven faculties, across economic, social, technological and environmental issues. Upheaval in the transport sector combined with concerns among the UCL community about the future of transport research, motivated the TI to develop this report as a strategic snapshot of transport and mobility research.

This paper draws upon a series of interviews with key stakeholders in academia and in research funding and commissioning in the UK, with the aim of:

- Clarifying how transport research is positioned
- Considering how transport research is funded
- Understanding the context for academic transport research
- Drawing out recommendations for the research community on optimizing the research environment for transport

We expect our findings to be relevant to academic researchers, consultant researchers, research commissioners and funders, and transport policy makers relying on evidence for transport decision-making. Our recommendations are aimed at the transport research community and those who work most closely with them.

## **Participants**

We contacted nine research groups at peer uni-

versities and were able to interview people at five of them, in addition to staff at UCL. Interviewees were promised anonymity and therefore we identify participant quotations only as either academic or commissioner/funder. Overall we talked to 20 people at the following 12 institutions:

- Department for Transport (DfT)—commissioner/funder
- Economic and Social Research Council (ESRC)-- commissioner/funder
- Edinburgh Napier University--academic
- Engineering and Physical Sciences Research Council (EPSRC)-- commissioner/funder
- Lancaster University--academic
- National Institute of Health Research (NIHR)-- commissioner/funder
- Transport for London (TfL)-- commissioner/funder
- University College London
- University of Leeds--academic
- University of Oxford--academic
- University of Westminster--academic
- UWE Bristol--academic

We circulated an initial draft of the report and received comments back from initial participants plus two additional reviewers (referred to as 'reviewer').

## **Overview of Transport Research**

For the purposes of this report, we might characterize transport and mobility research as sitting at the intersection of engineering, psychology, planning, health and environmental science. This

includes topics such as:

- Travel behavior: demand, choice, personal mobility
- Built environment: stations, morphology, streets, public places, planning
- Propulsion: fuels, engines, batteries, energy
- Environment: air quality, noise, disaster response
- Digital infrastructure: sensing, automation, transactions, ticketing, travel data
- Physical Infrastructure: road, rail, bridge, path, tunnel, vehicle
- Wellbeing: health, equity, accessibility, physical activity (active travel)
- Humanities: culture of travel, history, ethics, literature
- Safety and Security: crime, injury, accident, terrorism

Many of these areas of research intersect and overlap, for example active travel creates safety risks when cyclists mix with automobiles; travel behavior may be modeled or predicted through digital infrastructure; and shifting to battery-powered electric vehicles has implications for the built environment and safety, among other concerns.

We chose EPSRC and ESRC out of all the UK Research Councils, known collectively as Research Councils UK (RCUK), because these are the most central to transport researchers. It is worth noting at the outset that EPSRC has a relatively large annual budget of £807 million (plus an additional £52Million for world-class labs capital), a large

number of specifically named research areas, and twelve cross-cutting themes (DBIS, 2016). See Figure 1 where each circle represents an EPSRC research area. By comparison, ESRC has a relatively small budget of £155 million (plus an additional £28 Million for world-class labs capital) and a limited number of broad research topics as follows:

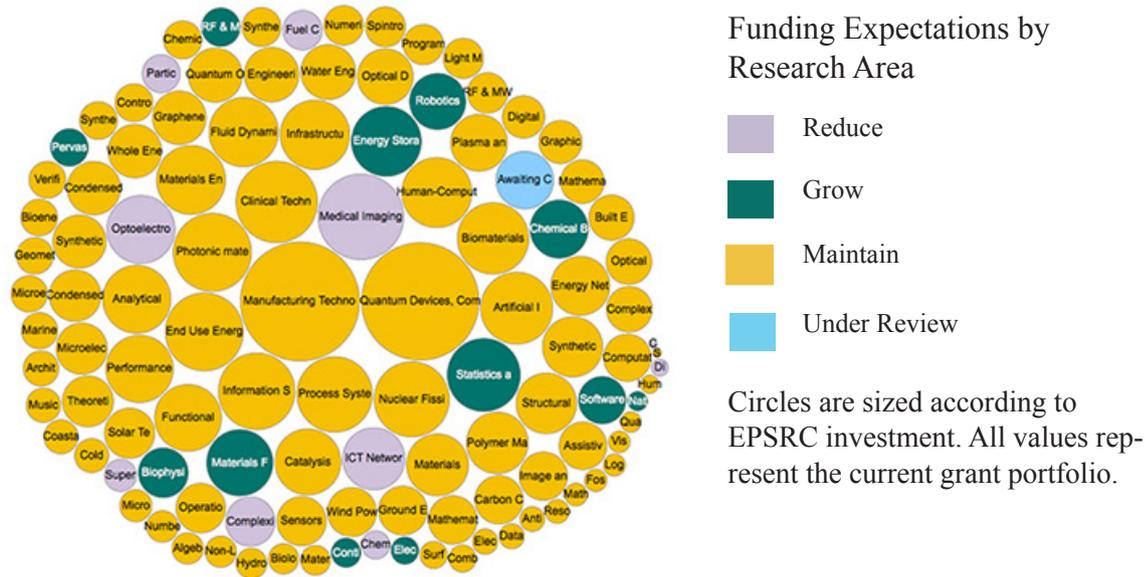
- Economy and business
- Environment
- Health and wellbeing
- International
- Public services
- Politics and governance
- Society

Other Research Councils that may contribute to funding transport research include:

- The Natural Environment Research Council (NERC) which funds environmental science (£291M plus \$40M capital)
- Arts and Humanities Research Council (AHRC) which funds research contributing to cultural welfare (£101M with no additional for capital)
- Biotechnology and Biological Sciences (BBSRC) which funds bioscience research and training that may be relevant, for example, to fuels. (£353M plus £64M capital)

In addition, Innovate UK, which is merging with Research Councils UK into UK Research and Innovation (UKRI), funds commercial development

**Figure 1: EPSRC Research Areas**



source: <https://www.epsrc.ac.uk/research/ourportfolio/vop/pack/RESEARCHAREA/>

of research (£561M core budget). Academic participation is typically limited to 30%, as the goal is to ‘concentrate on investment-worthy businesses’ and nurture ‘high growth potential SMEs [small and medium sized enterprises] in key market sectors, helping them become high-growth mid-sized companies with strong productivity and export success’ (Technology Strategy Board, 2016). UK researchers may also get funding from new Industrial Strategy Challenge Funds (bound to similar limits in academic participation as Innovate UK) and the Global Challenges Research Fund. Finally there are a number of NGOs and Charities that make small grants for transport-related research.

The remainder of the report follows in three sections. We first examine how transport research has come to be *positioned* or framed through various driving forces such as climate change and economic growth. We next look at the changing *context* for academic transport research in terms of funding, cross-disciplinary research and in contrast with consultancy research. Finally, *we reflect* on the analysis and questions arising for the academic research community and its stakeholders.

# POSITIONING

A fundamental tension that was clear immediately and throughout the interviews concerned the position of transport and mobility as a research topic. After years of being a ‘Research Area’ (Transport and Operations) at EPSRC, in 2017 this Research Area was removed and transport was captured under the research area ‘Infrastructure and Urban Systems.’ This move came as a blow to many transport researchers who saw the change as reducing funding and attention on transport research. In this section we examine the situation from several angles.

## Why the Change?

A commissioner/funder commented that in addition to responding to evidence from the research community,

This new research area [infrastructure and urban systems] was very much formed to respond to government priorities, so the Government Office for Science did a foresight project on future cities and urban living, RCUK has the Urban Living Partnership, so EPSRC wanted to respond and fit into this wider area of cities and urban living.

-commissioner/funder

At the same time most of our academic participants commented that transport, for better or worse, was rarely a research topic on its own:

We don’t do that much work that really looks at transport as a system in and of itself, it is always about how transport connects to other systems, other parts of the city, other domains of society. –academic

As a subject area in itself it’s been in reduce [funding] mode [at EPSRC] for a number of years, and the argument is that transport’s still there but it’s packaged up in other areas, other parts of RCUK’s portfolio...but it still does mean that transport has a lesser profile and it can be difficult to get success with a transport-driven research proposal.

–academic

Funders also expressed the view that transport was subsumed in research areas on cities and infrastructure to support urban living:

We wanted to break up silos that we think were there before; we wanted to have a more systems approach towards cities and urban living, and for transport that means to see transport within the wider infrastructure, that can be waste, water, energy and so on. –commissioner/funder

So, it comes up in lots of spaces, but very rarely does it say, this is a transport question. It says, this is a societal question and people move around. It’s always subordinated to other themes. –commissioner/funder

Money's going into these directed, often cross-cutting research questions that might be... you know, typically transport and something else, or it might not even be called 'transport', you know, 'transport' might not even appear in the headline even if there is a transport dimension to it.

–commissioner/funder

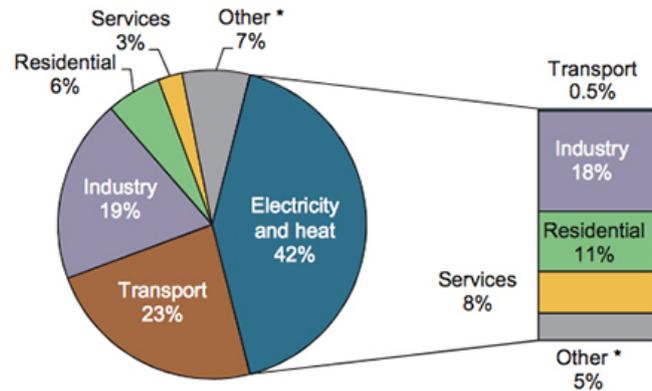
There are a number of driving forces that can account for the receding of 'transport' as a focus by itself. Below we explore these driving forces, including climate change/energy, national government priorities, rising interest in infrastructure and cities, health and the digital economy.

### Climate Change/Energy

Concerns of anthropogenic climate change and energy use has led to Research Councils UK developing an Energy Programme funded to £625 Million, which builds on an investment of £839 Million in the eight years leading up to 2011 (RCUK, no date). Three of EPSRC's 12 "grow" research areas include energy. Globally, transport contributes about 23% of greenhouse gas emissions (see Figure 2) and similarly in the UK it makes up about a quarter of greenhouse gas emissions. It is one of the top three emitting sectors of the economy (International Energy Agency, 2016).

With research councils ramping up spending on energy at a time when 'transport' is no longer a named research area, more transport researchers are tying their work to energy. For example:

**Figure 2: World CO2 Emissions from Fuel Combustion by Sector in 2014**



Source: International Energy Agency, 2016

Quite a bit of our research in transport is funded from the energy programme, so I think we're relatively good at tying in questions of transport with other bigger themes.

-academic

Because of the nature of the research for us, it doesn't really matter whether we say we want to reduce greenhouse gasses or we want to reduce air pollution. It's pretty much the same objective, so we can easily adjust. It's all about energy consumption in the end.

-academic

### National Government and Brexit

In terms of conventional transportation research, several participants talked of the UK government's years of austerity spending cuts, including Transport for London and the Department for Transport,

which has been ‘cut to the bone.’ Participants highlighted how the pressure for economic growth through technological innovation had shifted ‘transportation and mobility research’ to ‘technology and innovation research.’

Pressures to develop the UK’s post-Brexit economy have increased the focus on a particular subset of transport research aimed at innovation and commercialization. Electric vehicles, batteries in particular, and autonomous vehicles are highlighted in industrial challenge funding with a recent announcement covering the automotive sector and an additional ‘Transforming Cities’ fund for intra-city transport.

I suppose the big question on Brexit is, “what comes next?” and, “What is the UK for?” We’re going to have to be even more reliant on our research and development capacity in order to keep our place at the dinner table and that probably means clever science and technology; I’m not sure it means social research.  
–academic

In general, I would say funders seem to be interested in innovation, and innovation often defined as being products or services. But I don’t find that’s what’s wrong with the transport system...it’s the way that we manage what we’ve got that’s often much more the difficulty.  
–academic

### **Infrastructure and Cities**

Several interviewees pointed out EPSRC’s recent investment of £125 Million into the UK Col-

laboratorium for Research on Infrastructure and Cities (UKCRIC), with other partners investing an additional £90 Million. This investment funds nine national research labs across 14 UK universities, as described in Appendix A. These have framed a national discussion around infrastructure, broadly, bunching together water, waste, energy, transport and ICT, and further diffusing ‘transport’ as a research topic.

The EPSRC’s repackaging of transport into the research area of Infrastructure and Cities aligns with this UKCRIC spending. Meanwhile several participants noted that on the ‘cities’ agenda, technologically driven ‘smart cities,’ and the ‘science of cities’ are rising. In this scenario, the (technological) city system is the unit of study with transport as one of many components.

### **Health**

Healthy streets, active travel, and air quality are key transport-related areas rising up the public health research agenda. In public health there is a paradigm shift underway, highlighting a need for more holistic and systems thinking in public health research (Academy of Medical Sciences, 2016). In 2012, the National Institutes for Health Research (NIHR) launched the School for Public Health Research, a partnership between eight leading academic centres. The school is currently funded through 2022. In addition, public health practitioners moved from the NHS into local governments in 2013 (Local Government Association, 2014). In a health-centric view, transport is one tool among many to contribute to better public health.

## Digital Economy

Increasingly we have ‘big data’ for many aspects of transport and mobility systems; software companies are the big new entrants in the field. Wearables, sensors and the internet-of-things all signal further fundamental shifts. Meanwhile, digital networks enable the ‘gig’ and the ‘peer to peer’ economies, affecting the way we ship, travel, and commute (for example Deliveroo, Zipcar, Uber and remote working). In this data-analytic view, transport is but one supplier of the vital data that can grow the economy.

I think now there’s also been a shift back towards quantitative, with the big data context and the studies we’re doing of a more experimental nature, i.e. putting people in vehicles and seeing how they behave. That means quantitative data sets. -academic

The digital economy and the availability of data, big data, that’s becoming more prominent -academic

## Shifts in Transport Research

Each of the driving forces mentioned above highlights a particular framing for transport research. ‘It’s all about energy consumption,’ or it’s all about health. The UK’s austerity budget has reduced funding from sources such as DfT that used to headline transport. Now the Brexit agenda has selected elements of the ‘transport’ research agenda and repackaged them as technological innovation. One participant expressed it this way:

I think it is all really around these big technologies and how those can hopefully fix the economy. And broadly speaking, we’ve tried behaviour change and I think politicians have lost faith in behaviour change, if they ever had any. So we’re now back to technical fixes—electric vehicles, connected autonomous vehicles, un-manned aerial devices or drones; yes, these are the big themes at the moment and anything which supports the economy. -academic

Arguably, the organising paradigm for transport research had been, simply, ‘Transport.’ But with EPSRC’s revision of research areas, alignment with the government’s focus on future cities and investment in UKCRIC, we suggest that the new paradigm for transport research is ‘infrastructure.’

The shift puts ‘transport’ in the unusual position of being the only major form of infrastructure that does not have a research area or research theme within EPSRC. Table 1 shows that of six key types of infrastructure— building stock, water, health/medicine, ICT, energy, and transport—all, except transport, have an EPSRC Research Area. Three of these ‘Research Areas,’ health, ICT, and energy, are also among EPSRC’s twelve cross-cutting ‘Research Themes,’ making it easy to track their presence across different research areas.

**Table 1: Current EPSRC Research Areas and Research Themes Related to ‘Infrastructure’**

	<b>EPSRC Research Area(s) and other Research Councils</b>	<b>EPSRC Research Theme</b>
Built environment	EPSRC: Built Environment	No specific theme
Water	EPSRC: Water Engineering Natural Environment Research Council	No specific theme
Health/medicine	EPSRC: Medical Imaging Medical Research Council	Healthcare Technology: £380.7M
ICT	EPSRC: ICT Networks, Information Systems, Software Engineering, Pervasive and Ubiquitous Computing etc.	ICT: £405.2M Digital Economy: £151.4M
Energy	EPSRC: End Use Energy, Energy Storage, Fuel Cells, energy use, energy demand, Energy networks, whole energy systems, solar technology, wind power, etc. RCUK Energy Programme	Energy: £490.2M
Transport/mobility	No named research area	No specific theme

Source EPSRC: visualising our portfolio

The following section explores further how the positioning of transportation matters to both academics and commissioner/funders.

# CONTEXT

We heard from participants that alongside the receding of transport as a research area, there have been other factors affecting academic transport research, including funding sources and success rates, competition with paid consultants, and the manner of reward and recognition for research.

## **Funding Sources and Success Rates**

Academics we spoke to generally experienced funding to be less available overall, particularly for areas outside of technology-driven, often instrumental/operational research. There were several reasons given for this reduction. A number of organisations that used to fund research no longer can afford it, particularly public bodies under austerity. Similarly, consulting research for organisations, such as DfT, has dwindled under framework agreements where lead consulting companies list academic partners but do not use them. This was a very common sentiment:

We tend to get less consultancy than we used to because of the rise in the use of frameworks by government. It means that whilst we might be notionally on a framework, actually we don't lead the framework so the consultancy brings us on, but then doesn't give us any work.

-academic

Researchers working in the areas of wellbeing or behaviour change felt that their proposals suffered because of the shift toward technology-driven interests. Researchers also felt that EPSRC's reduc-

tion and finally removal of transport as a Research Area suggested that less funding would be available for transport itself.

Despite the apparent receding of transport as a research area, funders/commissioners stated that excellence in research is the key criterion and not named research areas or named research themes. They admonish researchers for not making their case for excellent research into transport and mobility, whatever the heading on a call, research area, or theme. For example:

Stop sitting, staring at our website, waiting for the name of the thing you do to appear. Start really doing what it is we're interested in and identifying how you can contribute to that [...]

Transport fits where it contributes

–commissioner/funder

I think there is a bit of confusion around what the EPSRC research areas mean, and specifically for transport since we don't have a research area that is called just 'Transport'. But, the research areas are more internally for EPSRC. They are not at all prescribing what researchers can or can't submit [...] We will sort it out internally, we won't reject a proposal because it doesn't fit nicely within just one research area. We will accept any proposal that is within EPSRC remit, and then we will find a place for that internally. –commissioner/funder

There was also a strong feeling, even among some commissioner/funders, that funding for researcher-driven projects ('responsive mode') had dried up.

Responsive mode is more or less dead  
–academic

Clearly there's been this shift towards much more directed programmes, so the funding bodies are shaping the research questions  
– commissioner/funder

It's much harder for that kind of academic to operate [in blue skies discovery research] these days unless he or she is absolutely top of their game. I mean, it's fairly hard to secure that kind of research income. –academic

So despite the emphasis on innovation and technical invention mentioned above, there is ironically a sense that research is increasingly prescribed by funders through directed (or targeted) challenges.

Indicated above and reinforced later in this report, the perception of the academic research community differs from the context that RCs are trying to project. Academics feel a paradigm shift, whereas commissioner/funders argue that little has actually changed. Commissioner/funders suggest that researchers are in control of what gets funded through peer review (see p. 15 'challenges in the review process') whereas researchers see government and business agendas driving major shifts in the research landscape. Recommendation one suggests a way for the academic research community to respond.

## **R1** Research Needs and Paradigm

We recommend that at the broadest level, the transport and mobility research community organize itself with key stakeholders to assess research needs and the paradigm for academic transportation research. A part of this process will be in anticipation of the end of EPSRC's current three-year delivery arc in 2019.

The community should come together now to articulate constructive ways for 'transport' research to be articulated within UKRI. For this and the broader process of examining the research paradigm, the community should look to the recent process undertaken for public health on optimising the research environment (Academy of Medical Sciences, 2016). In a transport and mobility setting, such a project might be characterized as 'Optimising the research environment for healthy, fair and productive mobility.'

The process of bringing the community together to examine the paradigm and research needs might involve:

- Strategic joint commissioning of the process by several stakeholder organisations
- Workshops (visioning/drivers), written evidence, roundtable discussions examining subtopics, Meetings with key decisions makers
- Commissioned landscape mapping
- Production of a strategy and recommendations

The process for addressing EPSRC/UKRI's new delivery plan might involve:

- Assessing if new stakeholders should be at the table, given rapid technological and conceptual change
- Determining the advantages or disadvantages of an EPSRC 'transport' research area or theme. Should the research community agree a position on this?
- DfT's 'Areas of Research Interest' and other expressions of research needs, and how the community is responding.
- Recently announced Industrial Strategy Challenge Fund for 'Transforming Cities.'
- Enhancing representation in peer review.

### **Further Squeeze on Funding**

Most interviewees were already worried that the receding of transport as a research area would (whether directly or indirectly) reduce funding. But they are also worried about the financial squeeze due to rising costs for data, Brexit, and rising competition from consultants who are better positioned to address fast-paced challenges. For example, one person expressed worry that more big data will increasingly fall under a paid model as agencies that hold data are pressured to further reduce costs and raise revenues. The bars on access to data are already rising and TfL's recent establishment of a commercial arm signals a further move in this direction, although TfL remains committed to principles of open data where privacy is not compromised.

Groups that rely on EU funding now anticipate a reduction in available EU research funds, if they

are available at all. There is also scepticism about the UK government entirely replacing this funding source. Recent research on the contribution of EU funding to UK research finds that between 2007-2013, EU research funding through FP7 accounted for just 3% of research funding in the UK (The Royal Society, 2015). However this 3% EU funding is not evenly spread. In fact, of the five academic groups we interviewed, three had a majority of their funding from the EU. Only one had a majority of their funding from UK Research Councils.

Although we do not have evidence, it is possible to speculate that the real or perceived decline in funding for transportation through RCUK has pushed more research groups to look for funding elsewhere such as the EU. A number of participants mentioned that they were more actively pursuing partnerships with non-EU international partners as a way of filling expected gaps in their funding.

There is no way to assess success rates for transportation research proposals. However, the perception that 'responsive mode is dead' suggests that success rates for 'responsive' proposals among transportation researchers are low. EPSRC stopped publishing success rates for responsive mode in 2011, however they do publish success rates for capability funding (roughly equivalent to responsive) and challenge funding (roughly equivalent to targeted) (personal communication, 11 November 2017). According to these published success rates, shown in Table 2, challenge (directed or targeted) funding has higher success rates. This may be because in targeted calls there is typically a preliminary call for Expressions of Interest, but only

a fraction of those go forward to a full proposal. In the table we have separated funding for research infrastructure, which falls into capability funding.

**Table 2: EPSRC Inferred Success Rates**

Year	Challenge (Directed, Targeted)	Capability (Responsive)	Research Infrastructure
15-16	38%	31%	67%
14-15	43%	37%	39%
13-14	54%	29%	43%
12-13	44%	36%	20%
11-12	62%	38%	93%

EPSRC has stipulated that 60% of its funding should be through responsive mode.

In the six years leading up to June 2017, ESRC’s annual success rate for directed funding ranged between 18% and 33%, with the overall proportion funded in that period being 24%. In the same period their responsive mode success rates varied between 12% and 25%, with 17% being funded overall (ESRC, 2017). Some analysts have suggested that once success rates drop below 20%, the process becomes a lottery and the time (estimated at 170 hours) spent writing an application is more likely to be wasted (Matthews, 2016).

### Lottery of Success

Despite the repeated emphasis by funders and commissioners on research excellence, there is a sense among academics that luck plays a substantial role in getting funding. A few comments include:

There’s such a degree of luck in actually getting the funding. I think we all get these experiences where you think, “well, this is a really good proposal” and it doesn’t get funded and other times you have a mediocre proposal that you think, “okay, let’s see what happens” and you have excellent reviews and you get the funding. -academic

Whilst it was relatively easy to get funding [at RC sandpit activities], there was a sense of if you were lucky enough to be in the room, you’d get a project but if you were really busy doing great research somewhere else and not available to be in the room then you were counted off. -academic

My concern with the EU funding is that you could put in some very good stuff and it won’t get anywhere and sometimes you’re lucky with something that perhaps is less high quality than you would have preferred. -academic

## R2 Responsive funding modes

We recommend that researchers pursue EPSRC responsive mode. EPSRC expects 60% of its funding to go to responsive mode proposals where success rates are moderate. By contrast ESRC success rates in responsive mode are falling below 20%, which means time may not be well spent applying to ESRC responsive mode.

### **Cross-disciplinary Research**

There is also a perception that transportation and mobility research often falls between two main research councils: EPSRC and ESRC. One participant described this as a ‘chasm,’ another as the absence of a ‘solid funder’ for transport and mobility research. An example of this sentiment:

There are some tricky-to-do behavioural studies that we would potentially like to get funded but as mentioned, they fall between the ESRC and the EPSRC; that’s been our experience in the past. Our studies relate to the transport system so they sound like EPSRC but actually they’re about individual behaviours, so EPSRC thinks they should be ESRC. -academic

Research councils have cross-council funding agreements, so if proposals come in and a council believes it might be in the remit, or partly in the remit of another council, then the proposal is shared and both may assess it (and fund it if successful). Councils typically share funding only in cases where the split is close to 50/50. As one funder commented, “If a proposal is only 10% in another council’s remit, it’s not worth messing about.” In the last few years, only a handful of cross-council proposals have come in, including both funded and unfunded, within the Research Area of Infrastructure and Urban Systems.

In response to a draft of this report, a commissioner/funder commented that, ‘it may not always be clear to applicants whether a grant has been agreed to be jointly funded by two research councils, as this is something we simply do internally after

receiving a proposal.’ Further they note that the cross-council funding agreement is meant to prevent the ‘chasm’ between councils but that there is a ‘remit query process’ for each of ESRC and EPSRC for applicants to use in advance of applying to determine where their application best fits. Finally, they suggested that EPSRC does fund the application of social sciences to engineering and physical sciences problems.

There were mixed perceptions from our Research Council participants on how helpful it is to indicate that you think your proposal falls between two councils. One indicated it could be useful (in a cover letter, for example). The other indicated that it suggests a failing at the Research Councils that does not exist. In other words, Research Council staff members are able to see for themselves which proposals sit across research council remits.

At the institutional level there are additional perceived cross-disciplinary gaps. For example government departments are siloed. One participant mentioned a case where the Department of Health (National Institute for Health Research) and the Department of Education both had calls out on the same topic at the same time. Only a random third party alerted them to the situation. Despite cross-council collaboration among Research Councils and Councils responding to government priorities, there were cases where funders were ‘divided by a common language,’ when talking about climate change, for example. Finally, given the disappearance of transport from EPSRC research areas and themes, it is hard to know what research in transport has been funded. Recently, the Depart-

ment for Transport requested a review of EPSRC funding to determine if EPSRC was funding DfT research priorities; there was no place to ‘see’ investment in transport research.

There is a perception that the Research Councils are too conservative. For example one funder mentioned the need to develop innovation grants for things no one else will fund. Another mentioned the example of Research Councils being unwilling to fund projects on newer areas such as citizen science.

### **Communicating Research Ideas**

Our participants noted that formulating and funding cross-disciplinary research is a challenge. Participants from different disciplines have different meanings for the same words, different expectations about funding levels, and different ways of working:

The key challenge remains communication, different expectations, different ways of conceptualising and understanding the world, different ways of thinking about behaviour. We’re involved in a project and partners from another discipline have a very different understanding of behaviour and how you intervene in behaviour than we would, so it’s quite challenging to find a middle ground that satisfies both sides of the equation. -academic

They [different disciplinary specialists] see the world in very different ways and before they can start working together effectively, they have to gain an understanding about each

other’s perspectives. So you need to invest resources in that before you invest resources in any inter-disciplinary research, otherwise your inter-disciplinary research can be a non-starter. -academic

Once a project establishes its common ground, there is still often a need for ‘ongoing sense-making,’ as one commissioner/funder called it, a need for continual check-in to make sure people are talking about the same things. In this sense cross-disciplinary research is more expensive than single-discipline research, all else being equal.

### **Challenges in the Review Process**

Peer review is at the heart of research funding, but participants flagged up a number of issues. Academics perceive that cross-disciplinary projects disadvantage them in the review process and that appears to be somewhat true. One commissioner/funder commented that the challenge of reviewing cross-disciplinary proposals is ‘old news.’ The on-going solution is said to rely on developing and spreading good practice.

One commonly perceived problem is cross-disciplinary proposals being rejected because reviewers know only one of the disciplines or the other, or only focus on one section of the proposal in an area they know, thus missing the interesting part of the proposal where two disciplines come together. The example given was where an economist evaluates the economics part of the proposal and thinks it does not look very interesting, original, or excellent; a mechanical engineer evaluates the mechanical engineering aspect and thinks the same, and

because neither knows the other discipline, neither give much consideration to the implications, which are extremely interesting, original or excellent, of how the two disciplines come together.

Several academic participants mentioned better outcomes from cross-disciplinary calls where special panels were assembled, tailored to the call:

It worked very well because it wasn't done just by peer review, it was done by a panel of people who were interdisciplinary in their own right. So I think it depends on how the Research Councils structure their review process. If you want something truly interdisciplinary then you have to not go to the normal community because the community tends to be less interdisciplinary and you have to get people who are known to have an Interdisciplinary viewpoint and get them on a panel reviewing proposals. –academic

But Research Council participants suggested this is not viable for all relevant panels.

In terms of peer reviewing itself, participants identified several unhelpful behaviors. One example is a few established individuals in review positions pushing their own agendas.

One thing we're trying to do is get away from having the same old, same old talking heads, you know, the really expert professors that have been doing something for 20 or 30 years, coming in and overemphasising what their interests are and getting programmes in that space...

The Research Council are lambs to the slaughter. They rely on what these people tell them.  
-commissioner/funder

In parallel, another academic flagged up the negative, individualistic competition among reviewers of transport-related proposals, where reviewers would tear down other proposals. This contrasted with other categories of research where the research community strategically focused on getting more research funding into the category overall and so provided positive, constructive reviews to peer researchers.

In response to a draft of this report, a commissioner/funder noted that the influence of Research Councils themselves on what gets funded is limited because peer review determines what gets funded. The Research Councils do organize and maintain the peer review process, set a delivery plan (which as noted earlier is influenced by government priorities), and set targeted challenges, but these are generally also influenced by the research community through calls for evidence or other means of input.

This commissioner/funder also noted the Associate Peer Review College, where academics (earlier or more established in their career) are encouraged to join, both to gain reviewing experience, and to ensure a diverse range of reviewers.

The key message from both research councils we interviewed was that it is important for researchers to get more involved in peer review, provide evidence, and hold pre-application discussions

with the RC research portfolio managers. Regardless of the extent to which an RC can influence what is funded, the portfolio managers are familiar with the workings of the councils and strategies for positioning proposals.

### **Consultancy versus Academic Research**

We asked about the relative value of academic research and consultancy research. Most participants stated a clear value for academic research. Key themes included: development of new and cutting edge knowledge, higher levels of rigor and independence, ability to challenge and be critical, access to international knowledge networks, more depth and complexity, and longer time frames.

In terms of developing new and cutting edge knowledge, participants saw this taking the form of methodologies, techniques, and findings that sometimes led to paradigm shifts. This was characterised as the ‘blue sky’ element in academic research that is felt to be disappearing. As one academic commented, ‘[with directed research challenges] the fixed ideas of what they want out of the analysis limits the level of innovation that you can explore.’

The independence of academic research is valued as more software and technology companies enter the transportation field.

At the moment a lot of that research is being driven by the providers [names of technology providers]. I think we need a much more robust corpus of knowledge from people who aren’t trying to flog you technology, to really

get an understanding of the implications and impacts of that technology. -commissioner/funder

Perhaps also as a result of the shift towards technical optimism, a number of participants feared a decrease in the traditional academic role of providing criticism and challenge:

If there’s nobody who’s doing the questioning, then we lose an important part of our society. That kind of critical questioning is extremely important, although I don’t think it’s particularly encouraged by the current set-up. -academic

I do feel that there is less and less money for research where there is not immediately an instrumental value to non-academic stakeholders and I think that’s very worrying. -academic

By contrast, most participants saw consulting as good for review work, applying existing techniques, models, or methods in known contexts. One characterised this work as repackaging knowledge on a short timeline. Another as the difference between asking ‘how many?’ (a question for consulting) versus ‘why?’ (a question for academia).

### **The Need for Timely, Accessible Research**

Despite the value participants saw in academic research, there were also some major drawbacks. First, the pace of change and the need for new knowledge in transport and mobility contexts is outpacing the speed of academic research. Decisions have to be made on shorter timelines to keep

up with technical change. Several commissioner/funders commented that it takes a year for a funder to set a research agenda.

Some participants saw this as an opportunity for academics to more tightly position themselves in ‘over the horizon’ research. For others there is a tremendous frustration that academic nitpicking and plodding pace are increasingly leaving missed opportunities in their wake. The perfect has become the enemy of the good. For example:

Sometimes [the rigorous, slow pace of academic work] is an enemy in its own right in the sense that it holds things up, and research takes so long to be done that it becomes irrelevant.  
-commissioner/funder

I get frustrated by an arduous process that takes a lot of time and rejects too many ideas because they are not rigorous enough, they’re not RCT [randomized control trial]. There’s such a need for any evidence at all for public health to enter into the transport debate that the academic research often takes too long.  
-commissioner/funder

When this happens, research commissioners turn to consultancies. One participant related that it would have been easy to get involved with transport operators to run some huge natural experiments, but that transport operators could not fund it and the academic funding mechanisms were too slow to respond.

A second drawback to academic research is that it

is often poorly presented to external stakeholders. “Academics often don’t understand how to present what they do,” commented one commissioner/funder. In a time-starved context (whether practice, policy or business), academics need to translate their findings into something meaningful to end users, in plain language. Examples include where findings are targeted at government policy makers who are mainly generalists, at citizen engagement venues, or at fast moving news and media cycles. This concern aligns with new measures of ‘research impact’ that require communicating findings in such a way that they can be applied and result in positive change.

### **R3** Cross-Discipline Work

We recommend that researchers make cross-disciplinary excellence more accessible to discipline-focused reviewers to counteract problems in cross-disciplinary work with language, concepts and understanding. Using plain language and respecting frequently time-starved contexts (whether practice, policy or business) will help academics translate their findings into something meaningful to end users.

### **R4** Rapid Response Research

We recommend the research community explore, with funders and commissioners, new models for academics to meet research needs in fast-paced, real world settings.

### **Research Impact and Measures of Success**

A final area of concern between researchers and funders is how research is recognized and rewarded—the measures of successful, or excellent, research. Research Councils sometimes reward achievements as impact that do not align with academic impact. For example, ESRC is trying to look holistically at societal challenges whereas academia still rewards output based on super-focused disciplinary specialism, especially in terms of journal publications, through processes such as the Research Excellence Framework (REF). Examples were given for the two disciplines of economics and health, where top academics must publish in specific disciplinary journals that would not accept cross-disciplinary research, no matter how excellent, for example in transport and health or economics and transport. New journals are launching, but with low impact factors. Even worse, some participants felt that transport is not a good fit for any sub panels in the REF.

Another issue that arose was that as ‘impact’ requires a bigger range of outputs (besides just academic papers in journals), it can be harder to stay abreast of, or capture the newest knowledge. In addition, in the context of real world research done by consulting firms, findings typically rest with clients. Similarly, political approval processes and limited resources often slowed and/or made hard to find the publications resulting from research commissioned by government organisations. Several commissioners commented that their organizations could improve on making findings

more accessible.

### **Perceived Gaps in Research**

A final effort in this project was to identify gaps in the landscape of transport and mobility research. In some areas of research, such as the public health and transport, participants felt the field was young and was, in some ways, mostly gaps. In other areas, such as social and behavioural aspects of transport and mobility, researchers felt there was little funding but also little interest by commissioners and funders.

One participant flagged a gap in knowledge about the institutional contexts that facilitate new technologies,

I think there’s a very important absent body of research that sits somewhere between institutional political science research and technical transport research, which is when this technology bumps into these institutions, how’s that going to go? And it’s not going to go the same in London as it is in Manchester, let alone in Budapest or Mumbai. And I just think there’s a real gap. –commissioner/funder

A specific example is a congestion charge working in London but not in Manchester. It is a proven technology but it did not fit their institutional, political, and cultural context. These types of questions seem to suggest, again, an area of research sitting between a social and technical remit. They concern socio-technical systems where a thorough investigation of both the technology and the social relationships are required.

Other areas suggested as gaps include:

- Borders, protectionism, especially with Brexit

We don't know what's going to happen with Brexit but it looks like international forms of mobility are becoming more complicated and I think there's actually real needs for transport researchers and people in law to collaborate on some of the issues that we're going to see because I think we're in for a very messy transition period. -academic

- Freight 'an important, overlooked and under-researched area'
- Optimizing existing transport networks in built up cities
- Understanding of behaviour: why, in the face of good feasibility and logical reasons, people do not take an action, such as increase their walking or cycling.
- The trade-offs between the benefits of pervasive sensing and privacy, 'Is it a good thing, that we can have an all-seeing, all-knowing society that can deliver great transport for you but probably know more about you than you really want it to know?'
- Aviation and the specific contribution to climate change
- Tourism, transport and mobility 'should be all part of one big field of study'

# REFLECTIONS

In this section we reflect on our analysis and discuss the possible advantages and disadvantages of the changes at EPSRC and the landscape for transport research. We examine how the research community might want to respond to a shift from a ‘transport’ paradigm to an ‘infrastructure’ paradigm for transport research.

The disadvantages of this shift have been forefront for the research community. The loss of a transport-focused research area, whether in response to government initiatives on cities, evidence from the research community, or to align with UKCRIC investment, is difficult. The subject became less visible and it was harder to track the research. It seemed to signal lower importance for transport research and potentially less funding at a time when other funding sources, such as consultancy, EU funding, and government agency funding are also drying up.

Further, a 2016 review of Supergen (Sustainable Power Generation and Supply), an RCUK Energy Programme project started in 2001 representing the ‘UK Government’s biggest single investment in fundamental research on low- carbon energy generation and sustainable distribution,’ found that transport-related work was diffuse, lacked coherence and was not suited to highlighting evidence-based options.

The Supergen Programme needs to work more collaboratively across the hubs in cross-cutting

areas. In particular, incorporate the research areas of decarbonising heating and low emission transport to rationalise the current diffuse research activities in the areas. (RCUK, 2016)

However, commissioners/funders have told us that research excellence and peer review are the channels that ‘decide’ funding, and not categories such as Research Areas. They have argued that nothing has changed in terms of available for funding transport-related projects.

One academic participant argued that the advantage of not having a ‘research area’ is that you are not ‘boxed in’ by that area. Instead you can more easily position proposals amongst all the drivers previously identified such as energy, economic growth, cities, health, digital economy, and more.

There are some key questions for the transport and mobility research community to consider in terms of the paradigm for research and improving the research environment. As long as other key areas of infrastructure have dedicated ‘Research Areas’ and transport does not, is it realistic to expect coherent, concentrated progress in this field on the scale that a ‘Research Area’ warrants?

Our interviews indicated that some researchers who have flexibility, such as data scientists, are already looking at more fundable research challenges in other areas. How does the transport research paradigm affect the interest of researchers? Research activity in transport also becomes diffuse,

as suggested by the Supergen review, or harder to see, even ‘invisible,’ as evidenced by DfT’s request to EPSRC about what is actually funded in transport.

On the other hand, what are the longer term advantages? We may be at the rough spot in the road as we switch paradigms. After an adjustment phase, will transport researchers find that the flexibility of an infrastructure paradigm broadens their funding base while attracting new researchers to the field?

Our EPSRC participant mentioned that the removal of ‘Transport’ as a research area, and the development of Infrastructure and Urban Systems as a new research area, was partly in response to input from the research community and ‘more than 90 pieces of evidence.’ One has to ask whether and how the transport research community responded to this call for evidence. One reviewer of this paper commented, ‘There was a time when we had representatives inside EPSRC who really understood the University Transport Studies Group community, what it did and what it had to offer. This seems to have faded away.’

Whether the paradigm shift is viewed as positive or negative, our recommendations suggest a way forward for the transport research community and its stakeholders, by:

1. undertaking a critical and reflective process for optimising the transport research environment to meet research needs
2. pursuing researcher-led funding more robustly

3. providing proposals that make ‘excellence’ easy to understand regardless of the discipline of the reviewer
4. examining new models for fast track academic research

The recommendations outline a process to enhance the research environment for delivering positive transport knowledge that supports wellbeing.

In pursuing the above recommendations, the research community should be mindful of:

- Understanding the unique way that transport touches peoples’ daily lives
- Balancing the social and behavioural side of research with the technological and commercial side in the socio-technical systems that make up transport, even in times of external pressure toward innovation, technology, and commercialisation
- Encouraging more coordination between agencies and funders dealing with transportation in contemporary ways, for example across modes.

### **Acknowledgements**

We would like to thank all the participants and reviewers in this study for their time and willingness to engage in discussions about transport research. We would also like to thank the UTSG for allowing us to share preliminary findings at a 2017 meeting where we were able to receive helpful feedback.

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# ANNEX A

## EPSRC's Investment in UK Collaboratorium for Research on Infrastructure and Cities

UKCRIC facility	Amount	University	Description
Person-Environment-Activity Research Laboratory (PEARL)	£9,000,000	University College London	configurable platform, acoustic system, lighting system, pop-up seating for 500
Advanced Infrastructure Materials Lab	£9,065,306	Imperial College London	Advanced Infrastructure Materials Lab: enhanced facilities for producing, processing, imaging, analysing and testing infrastructure materials
	£4,498,620	University of Leeds	Infrastructure Materials Exposure Facility: a field exposure site with full meteorological measurement capabilities, plus controlled environment climatic chambers for natural and accelerated ageing of the full range of infrastructure materials and assemblies in both in static and dynamic environments.
National Centre for Infrastructure Materials--Extreme Loading Facilities	£3,060,136	University of Manchester	Fire and Impact Laboratory for Resilient Infrastructure Materials: critical loading and characterization facilities for testing materials under realistic fire and impact loading conditions
			concrete, modified geomaterials, metals, polymers, composites, timber, masonry and asphalt, for use in civil infrastructure including structures, tunnels, pipelines, paving, track-beds and flood defences
Urban Water Infrastructure Facilities	£7,380,000	Cranfield, Newcastle, and Sheffield Universities	long term performance and serviceability of water infrastructure; effectiveness of active and passive technologies for managing flood water in urban areas; cheaper and more environmentally benign approaches to water treatment; full-scale testing of new technologies for treatment, distribution and collection networks and flood management; and smart water management systems.
National Water Infrastructure Facility: Distributed Water Infrastructure	£3,687,512	University of Sheffield	A new, modular surface water management facility with equivalent urban infrastructure test-beds for energy, transport and ICT will be delivered

National Research Facility for Infrastructure Sensing	£18,000,000	University of Cambridge	rapid prototyping and open-source microcontroller platforms to produce and develop novel sensors systems at a range of scales; vibration isolated and severe environment laboratories to test and calibrate sensors; Microelectromechanical systems (MEMS) lab; advanced structural dynamics and façade engineering laboratories; advanced geotechnic facilities, including laboratories for concrete, materials and durability testing; advanced facilities for data analysis and smart construction computation
National Buried Infrastructure Facility	£21,600,001	University of Birmingham	assessment of fully-instrumented buried pipes, culverts, shallow tunnels, barrier walls and other structures at or near full scale. The refurbished Transient Railway Aerodynamics Investigation (TRAIN) rig will facilitate research into air pollution, pressure transients and sonic booms in tunnels.
National Linear Infrastructure Laboratory	£41,643,000	University of Southampton	National Infrastructure Laboratory: research facilities for geomechanics, heavy structures, solid mechanics and infrastructure engineering, emphasis on infrastructure, rail and maritime engineering
National Soil-Foundation-Structure Interaction Facility	£9,600,000	University of Bristol	a large outdoor compound populated with modular reaction walls, reaction slabs, servo-hydraulic and other equipment and office spaces, which can be reconfigured and augmented to suit the needs of particular experiments.
National Infrastructure Database, Modelling, Simulation and Visualisation Facilities	£1,270,000	University of Oxford	research that acquires and interprets data on infrastructure and cities, models complex behaviours, visualises results and informs decision making
UK Collaboratorium for Research in Infrastructure & Cities	£9,671,331	Newcastle University	world class, and unique, research facilities in surface water management
National Observatory of Integrated Urban Infrastructure Labs	£3,470,851	Newcastle, Bristol, Cardiff, Manchester, Sheffield and Strathclyde Universities	network of interlinked urban infrastructure observatories for the digital capture, mapping, sensing, monitoring, and testing of real urban infrastructure systems over the long term. Capturing the complex interrelations and interactions of real systems with the environment, people and society.

Source: EPSRC <https://www.epsrc.ac.uk/research/centres/ukcric/>



Cover and Interior Images: Pathfinder Air Surveys Ltd. [Map and Street Guide, Metropolitan Winnipeg, Manitoba Canada from the Air, South-East]. 1:4,880. Winnipeg: Canadian News Company Ltd., 1965

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