**Leader for research in digital twinning for decarbonising transport**

Apply for funding to lead the establishment of a digital twinning research hub to support the decarbonisation and improved integration of the transport systems in the UK.

The leader will:

* network within academia, industry, policymakers and third sectors
* build an interdisciplinary consortium that will co-develop a research agenda and apply for the closed opportunity (up to £20 million) for a new digital twinning research hub
* lead the hub if the proposal is successful

You must be based at a UK research organisation eligible for EPSRC funding.

EPSRC will fund 80% of the full economic cost of each project up to £500,000.

Standard EPSRC eligibility rules apply. Research grants are open to:

* UK higher education institutions
* research council institutes
* UK Research and Innovation-approved independent research organisations
* eligible public sector research establishments
* NHS bodies with research capacity

Read the [guidance on institutional eligibility](https://www.ukri.org/apply-for-funding/before-you-apply/check-if-you-are-eligible-for-research-and-innovation-funding/eligibility-as-an-individual/).

You can apply if you are resident in the UK and meet at least one of the bullets below:

* employed at the submitting research organisation at a level equivalent to lecturer or above
* hold a fixed-term contract that extends beyond the duration of the proposed project, and the host research organisation is prepared to give you all the support normal for a permanent employee
* hold an EPSRC, Royal Society or Royal Academy of Engineering fellowship aimed at later career stages
* hold fellowships under other schemes (please contact EPSRC to check eligibility, which is considered on a case-by-case basis)

Holders of postdoctoral level fellowships are not eligible to apply for an EPSRC grant.

Submissions to this funding opportunity will count towards the [EPSRC repeatedly unsuccessful applicants policy](https://www.ukri.org/councils/epsrc/guidance-for-applicants/unsuccessful-applicants-and-resubmissions/repeatedly-unsuccessful-applicants-policy/).

This is the first stage of a 2-stage process designed to launch a new large-scale, interdisciplinary EPSRC research hub that will tackle key digital twinning research challenges, following a ‘learning by doing’ approach, to support and accelerate the UK transport systems’ transition to zero emissions, improve integration across the systems of transport and support economic growth.

The 2-stage process:

* stage 1: digital twinning transport leader for the decarbonisation and integration of transport systems in the UK
* stage 2: digital twinning research hub for the decarbonisation and integration of transport systems in the UK

Digital twins offer the potential to accelerate progress in achieving net zero, improving national security and national resilience, as well as delivering wider economic and societal benefits. The requirement for a national capability in digital twinning was identified in the [Integrated Review](https://www.gov.uk/government/publications/global-britain-in-a-competitive-age-the-integrated-review-of-security-defence-development-and-foreign-policy), and digital twinning also features within the following publications:

* [National AI Strategy](https://www.gov.uk/government/publications/national-ai-strategy)
* [Data for Public Good Report](https://www.gov.uk/government/publications/data-for-the-public-good-government-response/government-response-to-data-for-the-public-good)
* [National Infrastructure Strategy](https://www.gov.uk/government/publications/national-infrastructure-strategy)
* [Large-scale computing report](https://www.gov.uk/government/publications/large-scale-computing-the-case-for-greater-uk-coordination)

This funding opportunity is a major part of EPSRC’s contribution to the national capability in digital twinning.

### Scope

We are looking for a leader or co-leaders, who will create a security-minded, cross-sector, interdisciplinary consortium and research plan for a single new EPSRC digital twinning research hub. The research hub is a 5-year investment to undertake transformational and application driven research to address important digital twinning research challenges to support and accelerate the decarbonisation and integration of the transport systems in the UK.

This mission-led investment will form a key part of EPSRC’s contribution to the development of the national capability in digital twinning. The leader will need to build and lead the research hub to tackle key research challenges in digital twinning for decarbonising and improving the integration of UK transport systems.

The leader will also work collaboratively with other EPSRC digital twinning, decarbonisation and related, research investments as part of a cohesive enterprise targeted at addressing nationally important challenges.

The transport systems are the largest source of carbon dioxide emissions, accounting for 27% of UK emissions. Achieving sustainable transportation systems will require rapid technological change in the way people, goods and services are transported.

Digital twin development presents an excellent opportunity to:

* improve the user experience with increased journey reliability and decreased congestion
* reduce carbon emissions as next generational computation capability improves efficiencies, such as:
  + reducing air traffic stacking
  + smoothing traffic interchanges
  + improving logistics

Digital twins are virtual replicas and representations of assets, processes, systems, or institutions in the built, societal, or natural environments. They provide real or right-time insight into how complex physical assets and citizens behave, helping organisations improve decision-making and optimise processes.

Digital twins fundamentally differ from computer models as they can provide significant amounts of real or right-time data, allowing an appropriate level of interaction with the physical twin.

At the same time, certain types of proposals, actions and events can be modelled with unprecedented accuracy effectively offering the ability to experiment in a non-live environment of the real world.

In our strategic delivery plan, EPSRC stated that we will focus on 4 mission-inspired, interdisciplinary challenges, working across UK Research and Innovation (UKRI), but with engineering and physical sciences activities at their core. This investment spans 2 of those mission-inspired interdisciplinary challenges. They are:

* artificial intelligence (AI), digitalisation and data: driving value and security
* engineering net zero

For the first of these challenges, EPSRC stated that we will:

* generate scientific and technical advances to realise the benefits of AI and digital technologies, creating opportunities and improving outcomes for the UK economy and society
* deliver platform technologies that underpin a range of potential applications, as well as research and innovation across UKRI and its strategic themes
* encourage adventure, pushing boundaries to realise the transformational impact of digital technologies across industry and society

EPSRC recognised that a key outcome is enhancing national security to address the government’s Integrated Review and the UKRI strategic theme ‘Building a Secure and Resilient World’. Specifically, we committed to develop a digital twins use case in decarbonising transport which takes into consideration and embeds appropriate security in the way it is delivered and in the outputs it generates.

This opportunity and the research hub that will follow a successful proposal submitted under the second opportunity, will deliver on that commitment.

This investment will also help to address the engineering net zero mission-inspired interdisciplinary challenge. In our strategic delivery plan, we recognised that our engineering and physical sciences research is critical to the discovery, development, and deployment of solutions to tackle climate change, enhance sustainability and ensure economic prosperity and fairness.

We are committed to support a whole systems approach to developing the technological solutions which will decarbonise our economy and society, to create a sustainable net zero future.

The transport sector is advanced and well positioned to coordinate and create world leading advances in digital twinning to achieve the UK’s net zero ambitions, improve the user journey and support economic growth, as set out in [Decarbonising transport: a better, greener Britain](https://www.gov.uk/government/publications/transport-decarbonisation-plan). This plan is already delivering positive change, as detailed in the [Decarbonising transport: one-year-on review](https://www.gov.uk/government/publications/decarbonising-transport-one-year-on-review), helping to drive the investments needed to support necessary infrastructure and improve user confidence in new technology.

The EPSRC digital twinning research hub has the potential to build upon this existing expertise and the UK’s excellent research base to deliver the supporting research, people and skills necessary to deliver this vision.

EPSRC and key stakeholders such as the Department of Transport, envisage that 2 of the highest priority areas where an advanced digital twinning capability can add value are in decarbonisation and improving transport systems for the user through better integration:

* decarbonisation of transport systems: how digital twins can contribute to a systems-level understanding of the impact of different interventions on overall decarbonisation goals and provide methods through which changes can be made to influence and accelerate progress to decarbonisation
* improving transport for the user through improved integration:  
  how digital twins can be used to put people at the centre of decision-making and dynamically manage and improve the integration of transport systems, such as digital twins for:
  + public transport timetables linking modalities and operations
  + network management

A digital twinning capability for transport in the UK can also support economic growth.  
This opportunity is the first part of a 2-part process designed to fund an interdisciplinary research hub. The first stage will provide up to £500,000 of funding for 6 months, starting in June 2023. This stage is aimed at identifying a leader or co-leaders who will use the funding awarded to network within the UK research community and to act as a thought leader and ambassador. They will build an interdisciplinary consortium, who will work with the leader to develop a forward research agenda for the new EPSRC digital twinning research hub.

Only the successful digital twinning transport research leader will be invited to submit to the second stage as principal investigator and director for the new interdisciplinary, digital twinning research hub to support the decarbonisation and integration of the transport systems in the UK.

### Role of the digital twinning transport research leader

The leader will be expected to:

* partner with academia, government (local, regional and national), and industry to complement and build on existing and upcoming activities, infrastructure and investments in this space, including work taking place as part of the National Digital Twin Programme within Department for Business, Energy and Industrial Strategy (BEIS)
* coordinate networking activity to ensure excellence is drawn in from different disciplines and places across the UK
* engage with all stakeholders to form a cross-sector, interdisciplinary consortium across digital twinning, net zero, transport expertise and beyond
* identify and understand the important research challenges across all modes of transport and develop an agenda for future digital twinning activity in this space, taking into consideration the wider international landscape
* lead the consortium in the design of a detailed proposal for the new digital twinning transport research hub
* explore and establish not only the technical, technological and scientific advances, but also the social, behavioural, ethical, security, environmental, economic, legal and regulatory understanding required to underpin a digital twinning capability for transport that will support decarbonisation and improve integration
* contribute to the wider national and international digital twinning research and innovation community, including being an equality, diversity and inclusivity (EDI) role model
* report to and create a plan of engagement with EPSRC and work with other UKRI investments in this space, such as a digital twinning use case for the energy grid, to maximise benefits and ensure alignment between investments
* create a plan of engagement with Department for Transport (DfT) and the Transport Research and Innovation Board (TRIB) member organisations, in order to identify and develop the digital twinning use cases and ensure alignment between investments
* create a plan of engagement with the National Digital Twin Programme in BEIS, in order to understand the work taking place within the programme and ensure that there will be alignment between investments
* develop communications, knowledge exchange, and wider stakeholder engagement plans to co-create activities, disseminate findings and network throughout the duration of the award

The leader role is not solely about research facilitation and driving coordination across the digital twinning, decarbonisation transport agendas but is also outward facing in terms of engagement with stakeholders and understanding the political and research landscape. This could be through running series of workshops and activities to bring these communities together in an immersive way.

### Information on the future EPSRC digital twinning research hub

If the consortium proposal is successful, the appointed leader or co-leaders from this funding opportunity will establish and lead the EPSRC digital twinning research hub for the decarbonisation and integration of the UK transport systems. The leader will become the director of the research hub that will receive up to £20 million of EPSRC funding. They are expected to generate additional leverage to amplify this EPSRC investment.

This interdisciplinary research hub should follow a ‘learning by doing’ approach, developing a proof of concept for the next generation of digital twins for transport and connected sectors within a live and controlled testbed environment. The research should be transformational and application driven with a strong user focus, tackling digital twinning research challenges that no single organisation would be able to address on their own, but which would be of benefit to many across the whole of the UK transport and connected sectors.

The research hub must establish an appropriate management and governance model with effective monitoring and evaluation, develop a clear EDI plan, and support early career researchers. We expect the director to build a diverse and sustainable hub that integrates social, economic and environmental sustainability at all stages of the research and innovation process.

The successful leader will report to EPSRC and engage with the EPSRC leadership team as the use cases develop. They will also be expected to engage with linked digital twinning investments, including the National Digital Twin Programme in BEIS, and relevant governments and industry stakeholders, such as DfT, DfT’s TRIB member organisations and others, to identify and develop the digital twinning use cases for the future research hub.

The successful leader will need to strike an appropriate balance between addressing important digital twinning research challenges critical to the development of the national capability in digital twinning and using digital twinning as an approach through carefully selected use cases to tackle important and relevant objectives in the decarbonisation and integration of transport systems in the UK.

Some of the digital twinning research challenges that are required to build a national digital twinning capability include:

* data acquisition, analysis, curation, storage, processing, standardisation and sharing, including the interoperability and integration of complex spatial data from multiple sources and combining publicly available data with commercially sensitive data
* multi-fidelity and multiscale modelling, including working in high fidelity
* working in real or right-time
* using AI and different levels of automation
* challenges to federation of digital twins, including semantic rules for federation of digital twins, developed for different reasons, and defining a clear systems architecture
* digital safety and security, including cybersecurity, to understand vulnerabilities and build resilience through diversity and other paths
* uncertainty, complexity, validation, verification, and assurance, including assurance in safety critical applications
* decision making and understanding systems of systems, and how to most effectively use digital twinning based on clarity of purpose
* visualisation and user interface, making digital twinning as an approach accessible for decision makers and those affected by the system or systems
* working with large volumes of data to understand and improve systems and their interaction over time using large data storage while concurrently using edge computing to enable rapid interactions within systems using sensors and updates to optimise operation in the moment
* environmental sustainability, understanding and optimising the power efficiency of digital twinning as an approach through design and operation
* developing digital threads to develop, design, understand and optimise the performance of systems, and parts of the systems, over time
* using high performance computing and related infrastructure
* offline simulations and emulations, testing and improving options with digital twinning generating learning loops
* hardware and software for digital twins
* human behaviour and humans in the loop, including EDI, ethics, trustworthiness and personal data aspects, protecting privacy and security while empowering users
* infrastructure requirements
* liability, legal, standards and regulations
* aspects of public policy development, including balancing competing public goals
* supporting legacy infrastructure assets as well as new transport systems and their interactions
* skills development, including skills needed to work in multi and interdisciplinary settings
* cultural change while moving towards national and multi-modal level transport solutions

Please note this list is not exhaustive.

The research hub will act as a central focus point for collaboration with existing and future digital twinning transport research investments. It will address some of the above important research challenges, reaching beyond into the net zero landscape and taking a whole systems approach to providing real world solutions.

Work on some of these areas is already taking place as part of the National Digital Twin Programme and therefore liaison with this programme will be critical to ensure best use of resource and long-term alignment and to avoid duplication.

There are a wide range of possible transport specific use cases linked to decarbonisation and integration that the digital twinning research hub could address, such as:

* accelerating speed of net zero product development and improving quality of resultant technology
* optimisation and decarbonisation of fleets, freights or aviation
* managing traffic to deliver efficiencies on the road network
* supporting user mode shift to lower carbon options

The appointed leader will report to EPSRC and will need to closely engage with the EPSRC leadership team as the use cases develop.

They will also be expected to engage with relevant governments and industry stakeholders, such as DfT and DfT’s TRIB member organisations, to identify and develop the digital twinning use cases that will have the maximum impact on:

* achieving net zero
* improving integration across the systems of transport
* supporting economic growth

The transport sector is a system of systems, and as such actionable insights and lessons learned from the work of the research hub should be applicable to:

* different modes of transport
* different places
* connected sectors, such as the energy grid

The majority of the proposed research for the new digital twinning transport research hub must be within the remit of EPSRC.

### Long-term goals

The long-term goals for the leader are to:

* provide leadership and coordination on digital twinning transport research, including through the design and delivery of a world-leading digital twinning research hub for the decarbonisation and integration of the UK transport systems (if the funding proposal is successful)
* contribute towards the evidence base for digital twinning, informing strategies to meet the UK’s 2050 net zero target and broader global environmental and sustainability goals
* enhance utilisation and engagement with digital twinning research across society
* deliver digital twinning activity that will lead to real world solutions to decarbonise transport and enhance transport integration, codeveloped and coproduced with users
* ensure the work of the digital twinning research hub is conducted in a security-minded manner and that appropriate security is built into the outputs it generates
* deliver efficiencies in physical infrastructure management and proactive maintenance with digital twinning research activities, and as such reducing disruptions, costs and carbon emissions for the UK transport systems

Please note that the successful leader needs to be available to start work in June 2023. The successful leader is expected to continue to deliver a leadership role between the end of stage 1 and start of stage 2.

### Co-leaders

Applications are welcome for co-leaders. In this case, the distinct roles and responsibilities of the 2 co-leaders must be clearly set out. For example:

* ‘co-leader 1: strategy’
* ‘co-leader 2: management’

There can be a maximum of 2 co-leaders. 1 should be listed on the application as principal investigator and 1 as co-investigator.

Co-leaders must make clear to the panel how they would work together effectively and co-lead the wider consortium.

For applications with co-leaders, the application must demonstrate that the co-leaders jointly fulfil the assessment criteria.

### Funding available

Up to £500,000 is available from EPSRC for a period of up to 6 months. This grant is expected to start in June 2023.

The funding can be used for the following:

* principal investigator time
* co-investigator time
* administrative support
* project management support
* costs for networking activities and workshops, such as professional facilitator
* research associates salary to support workshops and other activities
* travel, networking and venues

We do not require this role to be full time. It is for you to assess how much time you could reasonably commit to this role balanced alongside your other responsibilities, to recognise the strategic, high-profile nature of this role and the anticipated level of commitment required to develop the consortia and research hub. You should be prepared to justify the time committed to the role.

Equipment over £10,000 in value (including VAT) is not available through this funding opportunity. Smaller items of equipment (individually under £10,000) should be in the ‘Directly Incurred – Other Costs’ heading.

Read more information on [our approach to equipment funding](https://www.ukri.org/councils/epsrc/guidance-for-applicants/types-of-funding-we-offer/epsrc-approach-to-equipment-funding/).

### Responsible Innovation

EPSRC is fully committed to develop and promote responsible innovation. Research has the ability to not only produce understanding, knowledge and value, but also unintended consequences, questions, ethical dilemmas and, at times, unexpected social transformations.

We recognise that we have a duty of care to promote approaches to responsible innovation that will initiate ongoing reflection about the potential ethical and societal implications of the research that we sponsor and to encourage our research community to do likewise. Therefore, you are expected to work within the [EPSRC framework for responsible innovation](https://www.ukri.org/about-us/epsrc/our-policies-and-standards/framework-for-responsible-innovation/).

Applicants planning to include international collaborators on their proposal should visit Trusted Research for information and advice on [how to get the most out of international collaboration while protecting intellectual property, sensitive research and personal and other sensitive information](https://www.cpni.gov.uk/trusted-research).

Applicants should ensure they are aware of and comply with any internal institutional deadlines that may be in place.

You must apply using the [Joint Electronic Submission (Je-S) system](https://je-s.rcuk.ac.uk/JeS2WebLoginSite/Login.aspx).

You can find advice on completing your application in the [Je-S handbook](https://je-s.rcuk.ac.uk/Handbook/index.htm#t=pages%2FJeSHelpdesk.htm).

We recommend you start your application early.

Your host organisation will also be able to provide advice and guidance.

### Submitting your application

Before starting an application, you will need to log in or create an account in Je-S.

All investigators involved in the project need to be registered on Je-S.

Any investigators who do not have a Je-S account must register for one at least 7 working days before the opportunity deadline.

When applying:

1. Select ‘documents’, then ‘new document’.
2. Select ‘call search’.
3. To find the opportunity, search for: ‘DT Transport Leader 2022’

This will populate:

* council: EPSRC
* document type: standard proposal
* scheme: standard
* call/type/mode: DT Transport Leader 2022

Once you have completed your application, make sure you ‘submit document’.

You can save completed details in Je-S at any time and return to continue your application later.

### Deadline

EPSRC must receive your application by 4pm on 8 February 2023.

You will not be able to apply after this time. Please leave enough time for your proposal to pass through your organisation’s Je-S submission route before this date.

You should ensure you are aware of and follow any internal institutional deadlines that may be in place.

### Attachments

As well as the Je-S application form, the following documents must be submitted:

* case for support (maximum 10 sides of A4)
* work plan (maximum one side of A4)
* justification of resources (maximum 2 side of A4)
* CV (maximum of 2 sides of A4 each for the principal investigator and the co-investigator, if having co-leaders)
* host organisation letter of support (maximum 2 sides of A4)
* cover letter (optional, maximum 2 sides of A4)

You should attach your documents as PDFs to avoid errors. They should be completed in single-spaced Arial 11 font (or a similar-sized sans serif typeface) with 2cm margins.

#### Case for support

This is the main body of your proposal. You must include the following sections:

* a detailed strategic vision for the leader or co-leaders of a new research hub focused on developing the national capability in digital twinning by conducting application-focused, ‘learning by doing’ research using digital twinning as an approach to support both the decarbonisation and integration of transport systems in the UK. Your vision should include the objectives and long-term goals that you will address in line with the requirements of this funding opportunity and how you will focus on digital twinning research challenges that enable you to both contribute to the national capability in digital twinning and accelerate the decarbonisation of transport
* how you will form and lead a cross-sector, interdisciplinary consortium to develop a proposal for a new research hub in this area and deliver real world solutions for decarbonisation, net zero and improved integration of transport systems in the UK
* evidence of your skills, expertise and experience to explain what you will bring as this research hub’s director or co-directors. Please include examples of prior successes and lessons learned from leading and managing complex interdisciplinary hubs to deliver impact and translate research outputs to users
* clear, demonstrable links to a wide range of stakeholders, including researchers, government (local, regional and national) and industry within the digital twinning and decarbonising transportation communities. Please include examples of previous stakeholder engagement and knowledge sharing and its impacts, and how you will reach across and develop a UK wide consortium
* a description of your proposed work plan for the 6-month funding period, detailing the description and justification for your planned activities and explaining how you intend to work with the UK Research and Innovation (UKRI) office, such as regular meetings and collaborations on the plans for the new digital twinning research hub
* how equality, diversity and inclusion and responsible research and innovation will be integrated at the core of the proposed work
* how emerging developments and changes in the digital twinning transport research landscape will be addressed throughout the life of the new research hub
* where and how you intend to attract additional funding to amplify the EPSRC investment
* expected time commitment to this role from the leader, and how you will manage existing commitments to build a successful consortium

Your case for support should be a self-contained description of your proposed work, with relevant background and references. It should not depend on additional information such as the inclusion of external links.

Assessors are advised to base their assessment on the information contained within the application and are under no obligation to access any such links. This means that links should not be used to provide critical information.

#### Work plan

Your work programme should be illustrated with a simple diagrammatic work plan, such as a Gantt chart. This should clearly set out a timeline for activities and delivery milestones.

#### Justification of resources

Your justification of resources should state that the resources you are requesting are appropriate to undertake the activity described in your case for support. It should also explain why they are appropriate, taking into account the nature and complexity of your proposal.

It should not simply list the resources required, as this has already been done in the Je-S form.

Where you do not provide an explanation for an item that requires justification, it will not be funded.

#### CV

You must include a CV for the principal investigator and another one for the co-leader if this is a joint application.

#### Host organisation letter of support

A senior leader within your organisation (such as pro-vice chancellor) must complete a statement in support of the application.

The statement should be on headed paper, signed, dated within 6 months of submission, and should state clearly the position held by the author. Note for co-leaders from other institutions, a host organisation statement is required from all institutions involved.

The statement should highlight the applicant’s key characteristics and skills which the institution feels highlights the applicant’s ability to lead in this role.

The statement should highlight the level of support that the host institution will be giving the applicant, specific to the development of the digital twinning transport research leader role, to the intermediate period between the end of this funding opportunity and the start date for the research hub, and to the potential research hub.

As it is expected that a successful leader will be the principal investigator of any potential research hub, the host organisation should demonstrate its support for both this initial application and the leader potentially hosting the future research hub.

#### Cover letter (optional)

This letter will only be seen internally by UKRI.

You can express any other information they feel is relevant to your application.

Read our [advice on writing proposals](https://www.ukri.org/councils/epsrc/guidance-for-applicants/what-to-include-in-your-proposal/).

### Ethical information section

EPSRC will not fund a project if it believes that there are ethical concerns that have been overlooked or not appropriately accounted for. All relevant parts of the ethical information section must be completed.

Read [further guidance on completing the Je-S form](https://je-s.rcuk.ac.uk/Handbook/pages/GuidanceonCompletingaStandardG/EthicalInformation.htm). EPSRC guidance can be found under ‘additional information’.

This funding opportunity is the first part of a 2-part process designed to launch a new digital twinning research hub to support and accelerate the decarbonisation and improved integration of transport systems in the UK.

### Part 1: Digital twinning transport leader for the decarbonisation and integration of transport systems in the UK

This part is aimed at identifying a leader or co-leaders to drive forward the investment in digital twinning research for the decarbonisation and improved integration of the transport systems in the UK from June 2023.

### Part 2: Digital twinning research hub for the decarbonisation and integration of transport systems in the UK

This is the invited part for a single full proposal describing the new research hub that will conduct application-focused research using digital twinning as an approach to support the decarbonisation and improved integration of transport systems of the UK, and the consortium of investigators who will achieve this vision.

This part is a closed opportunity. Only the consortium convened by the successful leader identified in stage 1 will be eligible.

The assessment process for this closed opportunity will begin in early 2024.

### Assessment process

#### Assessment process for the digital twinning transport leader for the decarbonisation and integration of transport systems in the UK

This opportunity will use a 2-stage assessment process.

Any proposals that do not fit the remit of the opportunity will be rejected prior to assessment.

Depending on the level of demand for this opportunity, EPSRC reserves the right to modify the assessment process as needed.

##### Stage 1: expert prioritisation panel

Proposals will be assessed and shortlisted against the assessment criteria by an expert panel in March 2023. A maximum of 5 applicants will be invited for an interview.

For the successful applicants, the panel will identify areas based on the assessment criteria that should be probed further at the interview stage. This will be shared with the applicants and they will be given an opportunity to respond before the interview stage.

Feedback will be provided to unsuccessful applications from the expert prioritisation panel at a later date.

##### Stage 2: interview panel

Successful applicants from the stage 1 expert prioritisation panel will be invited to an interview by an independent panel of experts in late April 2023. The applicants invited to interview will be notified in excess of 10 days before of the interview.

Full details of the interview process will be sent to candidates before the interviews. The interview panel will assess the applicants against the assessment criteria detailed below.

The panel will be invited to produce tailored questions based on the proposal documents for the applicants to consider ahead of the interview. These questions will only form a small proportion of the total questions which will be asked during the interview. Applicants should be prepared to answer additional questions specific to their proposal documents and related to the assessment criteria listed below.

The expert panel will assess the proposals and interviews to generate a rank ordered list to determine the successful leader or co-leaders. All interviewed applicants will receive feedback from the panel on their proposal.

Unsuccessful applicants are encouraged to engage with the successful leader to be a part of the consortium that will develop the future digital twinning research hub for the decarbonisation and improved integration of transport systems in the UK.

##### Feedback for the successful digital twinning transport leader

Following the expert interview panel, feedback will be provided to the successful leader.

The leader must take this feedback into consideration and actively engage with EPSRC as they form an interdisciplinary, cross-sector consortium that represents the UK and as they develop the proposal for the future research hub.

### Assessment criteria

#### Stage 1: expert prioritisation panel

The expert prioritisation panel will assess the full proposals against the assessment criteria detailed below.

##### Quality (primary)

Making reference to:

* a well-articulated vision and strategy for how the leader or co-leaders will achieve high quality, inclusive stakeholder engagement across a breadth of places, sectors and research interests to build a diverse interdisciplinary consortium
* an effective, well-articulated strategic plan for how the consortium will develop a proposal for a new digital twins research hub that will address major, long-term challenges to reduce carbon emissions and improve integration across the UK transport systems
* a plan for how the leader will embed equality, diversity and inclusion and responsible research at the core of the proposed work
* demonstrable experience of leading and managing successful large-scale, cross-sector, interdisciplinary programmes that resulted in delivering impact at both national and international levels
* experience of effective stakeholder engagement and knowledge sharing, involving diverse stakeholders in academia, government and industries from across the UK
* an understanding of the digital twinning transport landscape and of the interdisciplinary research and innovation needed to form a cohesive consortium and proposal that will address the opportunity’s objectives
* how they will deliver usable real-world solutions co-delivered and co-produced by users, that deliver a reduction in emissions, decarbonise the transport systems and improve integration of the transport systems in the UK

##### National importance (secondary major)

Including:

* contributes to or helps maintain the health of other disciplines
* contributes to addressing key UK societal and net zero challenges in places across the UK, covering England, Northern Ireland, Scotland and Wales
* contributes to future UK economic success and development of emerging industries across the UK, covering England, Northern Ireland, Scotland and Wales
* meets national needs by establishing and maintaining a unique world-leading activity
* complements other UK research funded in the area, including any relationship to the EPSRC portfolio

##### Applicants and partnerships (secondary)

The ability to deliver the proposed work, making reference to:

* appropriateness of the track record of the applicant, giving evidence of a profile within the research community for research excellence
* balance of skills of the leader, including, if appropriate, the added value co-leaders bring and why this is better than a single leader
* plans for engaging the broader landscape of digital twinning transport, decarbonisation, and net zero research in places across the UK and beyond
* awareness of the landscape of activities already undertaken and linking to existing investments where appropriate, in order to create a vibrant ecosystem of digital twinning research for the decarbonisation and improved integration of transport systems in the UK

##### Resources and management (secondary)

The effectiveness of the proposed planning and management and whether the requested resources are appropriate and have been fully justified, making reference to:

* effectiveness of planning and resource management to support community building from places across the UK and to deal with diverse policy systems in regions and nations of the UK
* appropriateness of resources requested
* how equality, diversity and inclusion, and responsible research and innovation, have been prioritised, and incorporated within the programme of work
* demonstration by the host organisations as to how they will support the applicants during this initial grant, and for the lifetime of the research hub, if subsequently funded

#### Stage 2: interview panel

The expert interview panel will provide the applicants an opportunity to respond to any questions raised by the prioritisation panel and will assess the applicants against the equally weighted criteria detailed below.

##### Community leader

The applicant or applicants must:

* demonstrate a profile within the research communities relevant to digital twinning, transport, decarbonisation and net zero, and their ability to effectively operate at the intersection between these communities
* have a clear and appropriate approach to collaborative leadership, in order to form a diverse and inclusive digital twinning transport research and innovation ecosystem
* provide evidence of leading and managing large-scale, interdisciplinary research, delivering demonstrable economic and social impact and translating research outputs to users (for example to industry, the innovation infrastructure, third sector or HM government), at both the national and international level

##### Thought leadership

The applicant or applicants must:

* demonstrate that they are mindful of the current research landscape beyond their own particular research focus area
* show evidence that they are able to assemble key information across disciplines to build a compelling narrative and communicate this, effectively, to the right stakeholders at the right time
* be able to demonstrate how they have given advice to or influenced users

##### Inspirational team and team leader

The applicant or applicants must:

* evidence their ability to guide and inspire their team and others and to identify and maximise potential in others (get the best out of people)
* describe how they would involve and support early career researchers as part of the activity
* describe how they will provide a supportive environment to all from an equality, diversity and inclusion perspective

##### Strategic vision

The applicant or applicants must:

* be a strategic thinker who is focused on ensuring the interdisciplinary research achieves maximum impact, and has considered the pathways to achieve this impact
* demonstrate an aptitude for identifying, exploring and developing research opportunities more broadly and across different interfaces
* demonstrate where they have positioned themselves to take up opportunities and have the ability to make decisions, responding to new and emerging issues throughout the duration of the award, to deliver their vision

### Integrated review and national capability in digital twinning

Department for Business, Energy and Industrial Strategy (BEIS) is the lead policy department for the development of the national capability in digital twinning. EPSRC, working with colleagues across UK Research and Innovation (UKRI) and with BEIS, have considered how the academic research community can play its part in the development of the national capability in digital twinning.

The digital twinning landscape includes investments across government and industry.

The leader should be aware of the digital twinning landscape, such as:

* other EPSRC and UKRI investments
* The National Digital Twin Programme (NDTP)
* Digital Twin Hub: a multisector industry and catapult network partnership housed at the Connected Places Catapult
* The Alan Turing Institute: artificial intelligence (AI) and data science, including for digital twinning, such as the Turing Research and Innovation Cluster in Digital Twins (TRIC: DT)
* The Apollo Protocol

### Upcoming EPSRC’s digital twinning investments

EPSRC is making a series of digital twinning investments linked to, and in some cases funded by, UKRI’s building a secure and resilience world theme.

The first of these investments is this funding opportunity, which is the first stage of a 2-stage process designed to launch a new EPSRC digital twinning research hub. The hub will tackle digital twinning research challenges to support and accelerate the UK transport systems’ transition to zero emissions, improve integration across the systems of transport and support economic growth.

The focus of this investment is on the transport sector because:

* it is advanced and well positioned to coordinate and create world leading advances in digital twinning
* of the inherent interconnectedness between different modes of transport, transport systems, people and places and transport systems and energy suppliers

The actionable insights and lessons learned from the work of the digital twinning research hub should be applicable to connected sectors, such as the energy grid.

The Department of Transport (DfT) and DfT’s Transport Research and Innovation Board (TRIB) member organisations recognise the need for research and development support to enable the UK to develop a world leading digital twinning capability for transport.

The implementation of digital twins will aid in the delivery of government environmental and economic aspirations through systems level approaches to transport, infrastructure, supply chains and safety, driving advancements in efficiency, customer experience and reduced costs.

The impacts and benefits of digital twinning of whole systems and processes will include simulation and virtual testing, which will inform long-term strategic decision making to produce better environmental, economic and consumer outcomes.

Concurrently to this digital twinning research hub investment, EPSRC, supported by additional funding from UKRI’s building a secure and resilience world theme, will be launching investments that will be bring together the research community across disciplines in support of the development of the national capability in digital twinning. This investment will be delivered as a digital twinning network plus.

The network plus will be expected to provide critical thought leadership in security, ethics and human interaction, and sustainability. In addition, EPSRC will make future investments in core research in digital twinning that can be taken forward for application in multiple settings and sectors.

A further upcoming UKRI and EPSRC digital twinning applied research investment will be focused on using digital twinning as an approach to support and improve the operation and resilience of the UK energy grid.

The strategy for EPSRC’s digital twinning investments is managed within EPSRC’s digital security and resilience theme, working in support of the EPSRC’s AI, digitalisation and data priority and UKRI’s building a secure and resilient world theme.

### Building a secure and resilient world strategic theme

The [UKRI strategy for 2022 to 2027: transforming tomorrow together](https://www.ukri.org/publications/ukri-strategy-2022-to-2027/), outlines 5 strategic themes which look to harness the full power of the UK’s research and innovation system to address major national and global challenges.

‘Building a secure and resilient world’ is 1 the themes under the auspices of which UKRI will catalyse, convene and conduct research and innovation, through taking a systemic approach that is human-centred, aimed at strengthening societal and economic resilience. The theme aims to enhance national security across virtual and physical environments, by improving awareness of risks and threats, preparedness, informed decision making and response, and allowing change to be understood as a force for good.

‘Building a secure and resilient world’ directly tackles core methodologies for supporting a better and more robust approach to managing crisis from business to government to communities. A core focus of the theme is on supporting systems thinking and decision making to reduce risk and strengthen our security and resilience, and showing how this should support, and be implemented by, communities at every level, from local to international.

We have identified 5 inter-related sub-themes, through which UKRI will deliver a range of activities tailored to enable resilience to different risks in different systems that:

* is built on the strengths of our current economy and society
* helps reduce vulnerability
* prepares for robust and rapid responses and enhances recovery
* encourages approaches which bring positive transformation

The 5 sub-themes are:

* global order in a time of change: enable UK to take one of the leading positions in shaping an international order that is secure, resilient and just
* technologies for resilience, security and defence: advance capacity of state defence and security, society and economy to reduce vulnerabilities, to respond to and recover from shocks through innovation and technological advancement
* resilient and secure supply chains: increase the resilience of supply chains (food, critical materials, manufacturing, complex systems) to a wide variety to potentially interacting shocks
* behavioural and cultural resilience: reduce the impact of shocks on individuals and communities through adaptation and embracing change, deployment of resources for personal resilience that is fair and just
* strengthening resilience in natural and built environment: mitigate impact of natural and anthropogenic hazards and risks on wider societal processes and operations in rural and urban contexts being responsive to particular requirements of place

This opportunity speaks directly to the ‘technologies for resilience security and defence’ sub-theme exploring and critically assessing the role of technologies in making systems more robust against external threats.

### EPSRC’s digital security and resilience theme

EPSRC’s digital security and resilience theme has been formed to put a spotlight on digital technologies relevant to the security, defence and resilience of the UK. The supported research will aim to create a more secure and resilient digital society that is robust and prepared to withstand shocks and challenges in an increasingly interconnected digital world.

We are doing this by:

* bringing relevant EPSRC investments under the new theme (around £120 million), while making connections across EPSRC and UKRI, and with key stakeholders
* developing EPSRC’s strategy and plans for digital security and resilience, and for specific topic areas falling under that remit, such as cyber security and digital twinning, while connecting across UKRI
* building communities, networks and capacity to develop national capability in specific digital security and resilience topic areas

Broadly, the digital security and resilience theme’s investments fall in 2 areas:

* mitigating risk: research to promote and improve the security and resilience of digital technologies
* creating opportunities: research into digital technologies that would be developed to promote and improve the security, defence and resilience of the UK, and the security and resilience of its organisations, systems, infrastructure and society

### Engineering net zero

EPSRC will support a whole systems approach to support the research and innovation critical to the discovery, development and deployment of solutions to tackle climate change, enhance sustainability and ensure economic prosperity.

The successful leader or co-leaders are expected to apply to the subsequent closed opportunity to establish and lead a new digital twinning research hub to support the decarbonisation and improved integration of the UK transport system.