



IABSE British Group

Henderson Colloquium 2026

Making Bridges Last Longer



Introduction

Since 1975, the British Group of the International Association for Bridge and Structural Engineering (IABSE) has hosted an annual two-day colloquium in Cambridge, bringing together around 25 invited participants from across the structural engineering community. The colloquium provides a forum for the exchange of ideas on a topic of current importance, with each participant giving a short presentation to stimulate discussion in the relaxed surroundings of Christ's College, Cambridge.

The theme of the 2026 colloquium was **Making Bridges Last Longer**, exploring the challenges and opportunities associated with extending the service life of bridge infrastructure through design, assessment, maintenance and innovation.

A dissemination event presenting the key outcomes and discussions from the colloquium will be held in Autumn 2026.

Our sincere thanks go to all the presenters for sharing their expertise and experience throughout the colloquium. The breadth of topics covered, together with the open and engaging discussions they inspired, helped develop a shared understanding of the challenges and opportunities associated with making bridges last longer.



Henderson Colloquium 2026 participants

Making Bridges Last Longer

More than fifty years after the Henderson Colloquium was first established, the 2026 meeting brought together twenty-five invited participants from across the bridge and structural engineering community to consider a question of growing importance: how do we safely maximise the useful life of our existing and future bridge infrastructure? The discussions brought together bridge owners, consultants, contractors, researchers, technology developers and policy makers, reflecting the multidisciplinary nature of the challenge. While the presentations covered a diverse range of topics, from structural monitoring and digital technologies to procurement, maintenance and design standards, a number of common themes emerged over the course of the two days.

Perhaps the strongest message was that making bridges last longer is not simply a technical problem. The engineering knowledge required to inspect, assess, strengthen and maintain bridges already exists in many forms. The greater challenge lies in deciding where, when and how those interventions should be made. Throughout the colloquium, speakers repeatedly returned to the importance of engineering judgement, recognising that the future performance of a bridge depends as much on informed decision making as it does on the technologies available to support it.

A recurring theme was the need to better understand existing structures before deciding upon intervention. Advances in sensing, non-destructive testing, digital monitoring and data analysis are providing unprecedented insight into the condition and behaviour of bridge assets. However, the discussions emphasised that technology alone cannot solve the problem. Digital tools provide information, but they do not replace engineering judgement. Their value lies in enabling more targeted inspections, improving confidence in structural assessment and allowing maintenance resources to be directed where they will have the greatest benefit.

Another consistent message concerned the importance of considering maintenance from the very beginning of a bridge's life. Several presentations demonstrated that many of today's maintenance challenges originate from decisions made during concept design, detailing and procurement. Designing for durability, accessibility, inspection and future adaptability was shown to offer significant opportunities to reduce whole-life costs and minimise disruption throughout a bridge's service life. Equally, speakers challenged procurement models that reward lowest initial cost without adequately recognising long-term performance and maintainability.

The discussions also highlighted that bridge management is becoming an increasingly complex systems challenge. Bridge owners face ageing infrastructure, increasing traffic demands, climate change, constrained budgets and shortages of specialist skills. As a result, maintaining every structure to the highest possible standard is rarely achievable. Instead, effective asset management increasingly relies on understanding risk at a portfolio level, prioritising interventions and balancing limited resources against safety, resilience and network performance.

Running throughout the colloquium was a strong sense that collaboration will be essential if these challenges are to be met. Bridge owners, consultants, contractors, researchers and technology providers each hold different pieces of the solution, and many speakers demonstrated the value of combining these perspectives. Equally important was the recognition that knowledge must be shared more effectively across the profession, ensuring that lessons from inspections, monitoring, research and near misses are captured and translated into better practice.

This report summarises the presentations and discussions from the 2026 Henderson Colloquium, capturing the key themes and messages that emerged throughout the event. The report concludes with a summary of the principal findings and a discussion of potential directions for future research and practice.

Daniel Dalton
University of Cambridge

Where do we start?

Richard Scantlebury, Hewson Consulting Engineers Ltd.

Richard opened the colloquium by framing the central challenge of the event: how can we safely maximise both the useful life of existing bridges and the durability of those yet to be built? Drawing on historical bridge case studies, he demonstrated that structural failures are rarely the result of a single issue, but instead arise from the interaction of design, construction, maintenance and decision-making. He emphasised the importance of understanding an asset throughout its entire life cycle, embracing inspection and data to inform engineering judgement, and learning not only from structures themselves but also from the experiences of others.

Concluding his presentation, Richard posed a series of questions that would underpin the discussions throughout the colloquium: *What do we know? What do we not know? How do we cope? How do we gather and use data?* and, perhaps most importantly, *How do we learn from both our structures and each other?*

Challenges of managing ageing bridges

Sara Subtil, National Highways

Sara presented the challenge of managing an ageing bridge stock from the perspective of National Highways, highlighting the scale and complexity of maintaining one of the world's largest highway networks. As increasing traffic demands, heavier vehicles and an ageing asset base place growing pressure on the network, she demonstrated how the number of recorded defects is increasing faster than they can be addressed.

A particular focus was placed on hidden safety-critical elements that are difficult to inspect and the challenges of understanding the condition of ageing structures before deterioration becomes critical. Sara emphasised that making bridges last longer requires better use of data, informed engineering judgement, proactive asset management, and sustained investment in the specialist skills and expertise needed to maintain existing bridge infrastructure for future generations.

Refurbish or replace?

Chris Tracey, Beaver Bridges Ltd.

Chris explored the engineering decisions involved in determining whether ageing bridges should be refurbished or replaced, demonstrating that the most appropriate solution depends on the condition, function and future requirements of each structure. Through a series of case studies, he highlighted the importance of detailed investigations, targeted repairs and innovative construction methods to maximise service life while minimising disruption to bridge users.

A recurring theme was that successful bridge management relies on understanding the true condition of an asset before deciding on an intervention. Chris showed how detailed inspections, structural health monitoring and long-term performance assessments can support more informed decisions, helping bridge owners balance whole-life performance with the practical challenges of maintaining critical infrastructure.

National Highways "Structures Moonshot"

Chris Mundell, AtkinsRealis

Chris introduced the National Highways *Structures Moonshot* programme, which is accelerating the development and application of innovative technologies for managing ageing bridge infrastructure. He demonstrated how the project has brought together clients, consultants, contractors and technology specialists to develop and validate new non-destructive testing techniques, emphasising that no single technology provides all the answers, but that combining multiple approaches can significantly improve understanding of structural condition.

Chris concluded by highlighting the importance of collaboration, knowledge sharing and continued innovation, with emerging technologies offering new opportunities to support the future management of bridge assets.

Making Bridges Last Longer – Aspirations and Reality

Stuart Baird, Transport Scotland

Stuart presented the challenges of managing Scotland's strategic bridge network from the perspective of Transport Scotland, highlighting the balance between long-term asset management aspirations and the practical realities of delivering maintenance programmes. He described the move towards a planned preventative approach, supported by risk-based prioritisation, to maximise whole-life value while maintaining a safe and resilient network.

The presentation also explored the practical constraints facing bridge owners, including ageing infrastructure, increasing traffic demands, climate change, and shortages in specialist skills and resources. During the discussion, Stuart highlighted the additional challenge of annual funding settlements in Scotland, which make long-term planning more difficult than under multi-year investment programmes. He concluded that making bridges last longer requires not only sound engineering decisions, but also sustained investment and effective long-term planning.

Detecting Hidden Defects in Concrete

Warren Thomas, Henderson Thomas Associates Ltd.

Warren presented recent developments in the inspection of post-tensioned concrete bridges, demonstrating how advances in non-destructive testing are enabling more accurate and less intrusive investigations. He showed how techniques such as ground penetrating radar and ultrasonic tomography can be used to locate tendons, identify hidden defects and target intrusive investigations more effectively, reducing unnecessary damage while improving confidence in bridge assessment.

The presentation emphasised that these technologies complement engineering judgement rather than replace it. During the discussion, Warren also highlighted the importance of experienced operators, noting the current lack of formal certification for some specialist inspection techniques and the need to ensure they are applied consistently across the industry.

Why is it that bridges don't last as long as might be hoped?

Richard Fish, Richard Fish Consultancy Ltd.

Richard reflected on why many modern bridges have failed to achieve their intended service lives, contrasting the longevity of historic structures with the challenges facing post-war bridge construction. He highlighted the influence of detailing, construction quality, procurement, maintenance planning and professional capability, arguing that many of today's problems stem from decisions made decades earlier rather than from the structures themselves.

Looking ahead, Richard emphasised the need for sustained investment in existing bridge stocks, greater consideration of maintenance during design, and future-proofing of new infrastructure. He concluded that meeting these challenges will also require continued investment in specialist bridge engineering skills, capacity and competence across the profession.

Balancing uncertain risks and tangible consequences

Jo Bonnett, COWI

Jo explored the challenge of balancing structural risk with the wider consequences of managing ageing bridges, questioning whether current decision-making gives sufficient weight to the impacts of closures, restrictions and demolition on local communities. Through a series of case studies, she highlighted the importance of considering social value, active travel and community connectivity alongside engineering risk, while recognising the difficult balance faced by consultants and asset owners operating within resource and liability constraints.

During the discussion, Jo emphasised the need for better communication with affected communities, greater consideration of alternative management solutions before demolition, and ensuring that sufficient specialist expertise is available to support robust engineering judgement when managing uncertain risks.

Making Bridges Last Longer, without costing the earth

David Coles, Department for Transport

David challenged the assumption that increasing investment alone will deliver longer-lasting bridge infrastructure, arguing that greater expenditure is not necessarily reducing the growing maintenance backlog or improving long-term outcomes. He suggested that current procurement models often fail to incentivise innovation, efficiency and good engineering, while increasing project costs through risk aversion and fragmented delivery. The presentation also highlighted the importance of reducing waste, improving productivity and creating procurement approaches that reward better engineering solutions rather than simply the lowest initial cost.

David emphasised the need to strengthen technical expertise within client organisations and to improve procurement practices so that consultants and contractors are better incentivised to innovate and deliver long-term value.

Why knowing our bridges better is the key to making them last longer

Rufus Foster, GScan

Rufus explored the importance of fully understanding existing bridge assets before making major intervention decisions. Through recent case studies, he demonstrated that record drawings do not always reflect what was actually built, with potentially significant implications for structural assessment and asset management. He showed how advanced inspection techniques can improve understanding of a bridge's true condition and capacity, supporting more informed decisions and helping to avoid unnecessary interventions.

It was discussed that investigations should be viewed as an investment rather than a cost. During the discussion, Rufus questioned whether the industry places too much reliance on as-built drawings, encouraging engineers to seek stronger evidence before making decisions on the future of ageing bridge infrastructure.

Concrete that lasts in a warming, digital world

Janet Lees, University of Cambridge

Janet explored how advances in digital technologies can support the development of more sustainable and durable concrete infrastructure. She demonstrated how improved data collection, digital traceability and enhanced testing techniques can provide a better understanding of concrete behaviour, helping engineers to optimise material use, reduce embodied carbon and improve long-term performance.

Digital tools should support better engineering judgement rather than simply generate more data. Janet concluded that combining practical testing with digital technologies offers significant opportunities to improve decision making and accelerate the adoption of lower-carbon concrete.

Modern strengthening for old bridges

Lucas Wise, VSL International

Lucas explored how specialist inspection and strengthening techniques can extend the life of existing bridge infrastructure while avoiding unnecessary replacement. He described a structured approach to bridge assessment, combining desktop studies, non-destructive testing and targeted intrusive investigations to better understand structural behaviour before selecting an appropriate intervention.

The presentation also highlighted a range of modern strengthening solutions for ageing bridges, emphasising that successful interventions depend on understanding load paths, construction sequence and deterioration mechanisms. Throughout the talk, Lucas showed how specialist engineering knowledge and targeted repairs can play a key role in making bridges last longer.

Investing early to make bridges last longer

Jason Hibbert, Welsh Government

Jason presented the challenges of managing the Welsh strategic road network, highlighting how years of underinvestment have contributed to a growing maintenance backlog and declining bridge condition. Through a series of case studies, he demonstrated that early intervention can significantly reduce long-term costs, disruption and carbon, whereas delaying maintenance often results in more extensive repairs or even bridge replacement.

Jason highlighted in the discussion the importance of predictable long-term funding to support effective asset management, together with continued investment in technical expertise and emerging technologies to better understand bridge behaviour and prioritise future interventions.

The hidden carbon cost of bridge maintenance

Cameron Archer-Jones, VSL/Net Zero Bridges Group

Cameron explored how traffic management can be a major contributor to the carbon footprint of bridge maintenance. Through a series of examples, he demonstrated that emissions associated with road closures, diversions and congestion can often exceed those arising from the maintenance works themselves, particularly on heavily trafficked routes.

Extending the life of existing bridges through timely maintenance remains highly beneficial from a carbon perspective. Cameron concluded that the environmental impacts of traffic management should be considered alongside engineering and economic factors when planning maintenance and selecting intervention strategies.

Using digital technologies to support bridge management

John Amitage, Ramboll

John explored how digital technologies can improve the long-term management of bridge infrastructure by providing better information to support engineering decisions. He demonstrated how monitoring, inspections and emerging sensing technologies can be used to better understand bridge behaviour, capture knowledge over a structure's lifetime and identify deterioration before it becomes critical. Throughout the presentation, he emphasised that digital technologies should support, rather than replace, sound engineering judgement.

A key theme was the need to adopt a portfolio approach, using digital tools to help prioritise limited maintenance resources where they will have the greatest benefit. During the discussion, John highlighted the importance of creating effective feedback loops, ensuring that lessons from inspections, monitoring and bridge performance are captured and used to improve the management of future bridge assets.

Long-life bridges: applying construction lessons and preservation technologies

Mark Bulmer, AECOM

Mark explored how decisions made during design and construction can have lasting consequences for the maintenance and operation of bridge infrastructure. Through a series of case studies, he demonstrated how value engineering can sometimes reduce initial costs while increasing long-term inspection, maintenance and operational requirements, emphasising the importance of assessing proposed changes from a whole-life perspective rather than focusing solely on capital cost.

It was also highlighted that modern preservation techniques that can extend the service life of existing bridges. Mark showed how targeted interventions, monitoring and technologies such as cable dehumidification can slow deterioration and support more effective long-term management of ageing bridge assets.

Managing ageing highway structures in a constrained environment

Nicola Head, Transport for London

Nicola presented the challenges of managing Transport for London's ageing highway structures under significant funding constraints, demonstrating how years of underinvestment have led to a growing maintenance backlog and an increasing reliance on interim measures to keep structures in safe operation. She described how improving inspection quality, strengthening risk-based decision making and focusing on the highest-risk assets are helping to prioritise limited resources while maintaining network safety.

A key theme throughout the presentation was the need for the profession to develop the skills required to manage deteriorating infrastructure rather than solely designing new structures. Nicola concluded that improving the understanding of ageing assets, supported by reliable data and proactive maintenance, will be fundamental to extending the life of existing bridge infrastructure.

Designing new bridges for a longer future

David A. Smith, AtkinsRéalis

David explored how design standards and project requirements can shape the long-term performance of new bridge assets. Using HS2 as a case study, he demonstrated how whole-life thinking can be embedded into bridge design through greater emphasis on durability, maintainability, accessibility, drainage and future adaptability, moving beyond minimum code compliance to reduce long-term intervention and disruption.

The presentation also reflected on the challenges of translating these ambitions into practice. David highlighted how procurement models, contractual incentives and technical capability can limit innovation and whole-life optimisation, concluding that designing bridges for the future requires not only good engineering standards but also the right commercial and organisational environment to deliver them.

Leveraging insights from sensing to extend structural working life

Sam Cocking, University of Cambridge

Sam explored how long-term structural monitoring can improve understanding of bridge behaviour and support more informed decisions on the management of ageing infrastructure. Through two masonry bridge case studies, he demonstrated how sensing technologies can reveal the effects of loading, environmental conditions and deterioration, providing insights that are not always apparent from conventional inspections alone.

It was clear from Sam's presentation that monitoring data should become part of the engineering decision-making process rather than simply being collected and archived. Sam concluded that integrating sensing with engineering judgement offers significant opportunities to better target maintenance, understand deterioration and extend the working life of existing bridge assets.

Asset Custodianship

Tom Bartley, InfraSpark

Tom introduced the concept of *asset custodianship*, advocating a shift from maintaining individual assets to safeguarding the performance of entire infrastructure systems. He argued that bridge owners increasingly face constrained resources and competing priorities, meaning decisions must be based not only on asset condition, but also on the risks associated with function, safety, longevity and cost. Throughout the presentation, he demonstrated how digital technologies and artificial intelligence can support more informed, risk-based decision making by improving data quality, prioritisation and the efficient use of limited resources.

During the discussion, Tom reflected on the wider challenges facing the industry, including funding, skills and procurement, while highlighting the importance of learning from near misses and sharing knowledge before failures occur.

Can we do more with what we already have?

Saul Jones, University of Cambridge

Saul explored how better use of existing data can improve engineering decision making, reduce unnecessary material use and help extend the life of infrastructure assets. Through examples from concrete performance and reinforcing steel, he demonstrated how analysing large datasets can reveal opportunities to reduce conservatism, lower embodied carbon and optimise designs, while maintaining confidence in structural performance.

It was also discussed that valuable data already exists but is often fragmented, underused or disconnected from engineering decisions. Saul concluded that improving the way data is collected, shared and interpreted has significant potential to support more efficient, sustainable and evidence-based infrastructure management.

Embedding operation and maintenance into bridge design

Andrew Hodgkinson, Hewson Consulting Engineers Ltd.

Andrew explored how the long-term performance of new bridges is largely determined by decisions made during the concept design stage. Drawing on experience from bridge owners and recent projects, he demonstrated how future operation and maintenance liabilities can often be eliminated or significantly reduced through thoughtful design, detailing and specification, rather than being addressed many years later.

Central to the presentation was the proposed *Eliminate–Reduce–Inform (ERI)* framework, encouraging designers to minimise maintenance liabilities wherever possible, incorporate features that simplify future inspection and repair, and clearly communicate key design assumptions to bridge owners. Andrew concluded that embedding operation and maintenance considerations into the earliest stages of design is fundamental to delivering longer-lasting bridge infrastructure.

The balancing act of bridge management and prioritisation

Chris Brock, AtkinsRéalis

Chris explored the challenge of managing ageing bridge infrastructure within increasingly constrained budgets, limited resources and growing demands on the transport network. He argued that effective bridge management requires a shift from reactive interventions towards intelligence-led, risk-based decision making, where inspections, monitoring, maintenance and assessment are proportionate to the level of risk and the importance of each asset within the wider network.

Chris noted the need to consider bridges as part of a wider system rather than in isolation. Chris demonstrated how combining engineering judgement with progressively richer information from inspections, monitoring and advanced assessment can help target interventions more effectively, maximise the value of limited resources and reduce the risk of future failures.

Moving Forward

The concluding discussion reinforced that making bridges last longer is not solely an engineering challenge. While advances in inspection, monitoring and assessment continue to improve understanding of bridge condition, participants recognised that procurement, funding, skills and the effective use of data are equally important in determining how successfully infrastructure can be managed over its lifetime.

A recurring theme was the need for stronger collaboration and knowledge sharing across the profession. Participants discussed opportunities to develop better feedback loops, improve the use of industry-wide datasets and establish a mechanism for capturing and sharing near misses and emerging issues before they develop into more serious failures. Better integration of information between owners, designers, contractors and researchers was seen as essential to supporting informed, risk-based decision making.

Finally, there was broad agreement that long-term stewardship of bridge infrastructure requires changes beyond engineering practice alone. Procurement and funding models should better reward innovation, whole-life value and proactive maintenance, while continued investment in specialist skills and technical expertise will be essential. The discussions concluded with a shared recognition that extending the life of bridge infrastructure will require coordinated action across the profession, supported by collaboration between industry, academia and government.

