



# Transport Infrastructure Efficiency Strategy

# One Year On Report

Version 1.0

March 2019



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# Foreword

I am pleased to have taken up the role of Chair of the Transport Infrastructure Efficiency Taskforce (TIET). The Transport Infrastructure Efficiency Strategy (TIES) presents an opportunity for client bodies to work together to help, where we can, to drive efficiency, making the most of our investment in infrastructure to improve productivity and support growth across the UK.

## The TIES aims to lead through:

- an improved understanding of costs and performance through benchmarking;
- the uptake of innovation; and
- improved delivery – through our project initiation and procurement mechanisms.

A good understanding of costs and performance underpins success in innovation and effective delivery. For this the second year of the taskforce, our focus will be on benchmarking and the benefits which emerge from doing it effectively. The TIES CEOs and I have agreed to share information as much as we can. There has been some progress in the first year, with the establishment of a forum and the review of our cost estimating capability. We will build on the activity to benchmark common assets and I welcome the IPA's recommended methodology for best practice in benchmarking, (launched alongside this report), as providing a helpful step towards consistency. In the longer term, improving the understanding of total programme costs; harmonising standards; and the support for strategic objectives such as lower emissions; less waste; and reducing carbon will be key measures of success.

Innovation in the design, construction and maintenance of our infrastructure is a real opportunity to meet these objectives. It has particular challenges in transport where legacy infrastructure - often from Victorian times – needs to be seen alongside, new, cutting-edge, digital systems.

During 2018, TIES partner organisations committed to rolling out automated design where possible in our programmes. Initial work carried out by TIES and the IPA showed that savings could be up to £1bn across the transport infrastructure pipeline. Further harmonisation and digitalisation of standards can help this. Whilst we have many good examples set out in this report, in practice, we also need a more thorough understanding of the costs and benefits of adopting modern methods of construction across our programmes, and the proportion of these where the application could offer real benefits across the whole life of an asset. Transport clients, with our combined spending power, have a key role in driving the demand for new approaches, so TIES can be a strategic "guiding mind" for the delivery of digital and manufacturing technologies through the Transforming Construction Alliance; the I3P innovation platform; and the Transport Research Innovation Board.

The greatest opportunities for us to drive efficiency are clearly during the early stages of investment planning, so we need to make sure that the objectives set out in the TIES are embedded at all stages of the specification, procurement and delivery processes.

To support this, we will launch a TIES challenge panel, comprising experts from a diverse range of disciplines, to which projects or programmes in their early stages could voluntarily submit. The panel would act potentially as a critical friend, using the deep knowledge pool across the TIES member organisations and outside expertise, to support and advise projects how to approach the range of issues of interest to TIES as part of the project initiation process. We would hope to have the panel in place by the autumn of this year.

Developing long term relationships with our suppliers helps with innovation to realise efficiencies. For example, within my own organisation at TfL, our work at Bank Station Capacity Upgrade and on the Northern Line Extension projects as well as our recently awarded 4-year track renewal contract are great examples where this approach has helped us achieve value for money underpinned by a strong focus on safety.



*I am looking forward to working with all our TIES partners towards a successful second year*



Mike Brown MVO  
Commissioner,  
Transport for London

There are also other excellent examples of this approach amongst our partners, such as the Highways England A14 Integrated Delivery Team and the Network Rail Track Alliances. I also recognise the progress made by Project 13, run by the Infrastructure Client Group. TIES will work closely with the Infrastructure Client Group and the Construction Leadership Council, to ensure our programmes align and are mutually beneficial.

Collaboration is key to the TIES' success. The benefits to infrastructure delivery and ultimately to passengers, depends on the commitment of the partner organisations. I am grateful to the other transport CEOs in Highways England, Network Rail, and HS2 Ltd and their teams. In our second year, I am keen to work with other infrastructure clients whose participation could offer mutual benefit to our collective endeavour, and I hope to announce an expansion of our taskforce soon.





# Introduction

**Infrastructure investment is trebling to a historic high.** Efficient delivery is critical to drive growth and productivity, and to realise better outcomes for transport users. That is why the Department for Transport (DfT), Highways England, HS2 Ltd (HS2), Network Rail, Transport for London (TfL) and Crossrail Ltd collaborated to develop the Transport Infrastructure Efficiency Strategy. We refer to these organisations collectively as the ‘TIES partners’.

**The Transport Infrastructure Efficiency Strategy (TIES)<sup>1</sup>** set out to drive efficiency by transforming delivery at each stage of the investment lifecycle. It set seven challenges, recognising that the greatest opportunities for efficiency are during the early stages of investment planning, through collaboration and shared problem solving. The TIES approach is to adopt, implement and scale-up good practice. This supports continuous improvement, better understanding of cost and performance, and innovation.

**We are not delivering in isolation.** TIES is part of the suite of government and industry initiatives designed to transform construction. It is aligned to the Infrastructure Project Authority (IPA) Transforming Infrastructure Performance (TIP) Programme; the Government Construction Strategy and both the Construction and Rail Sector Deals. We work closely with the National Infrastructure Commission (NIC), Infrastructure Projects Authority (IPA), InnovateUK, and the Construction Leadership Council (CLC).

TIES is a strategic guiding mind for Infrastructure Industry Innovation Platform (i3P), an independent innovation community. It influences priorities through the chairmanship of HS2 and the membership of all the TIES partners. We seek constructive challenge through DfT’s Science Advisory Council (SAC), and we engage the research and innovation sector through the Transport Research and Innovation Board (TRIB).

TIES is committed to report on progress annually, through the Transport Infrastructure Efficiency Taskforce (TIET). The strategy was published in December 2017 and this is the first annual report.



*We have a collective interest in driving efficiency. TIES has made progress in its first year and I'm confident the collaboration will gain even more momentum under its new leadership.*



**Bernadette Kelly CB**  
Permanent Secretary,  
Department for Transport

# Taskforce

## The Transport Infrastructure Efficiency Taskforce (TIET)

The TIET leads the implementation of the TIES. It sets direction and provides oversight and challenge across all the TIES work streams. It comprises senior decision-makers from the TIES partners, and senior stakeholders from across government. The secretariat is provided by the DfT. TIET partners are uniquely placed to embed and drive change in their organisations, drawing on cross sector expertise.

In recognition of the need for strong leadership, the Permanent Secretary has appointed Mike Brown MVO, Commissioner, Transport for London as Chair.

In Year 2, we will aim to expand our membership to increase our momentum further.

Meetings are also attended by the Department for Business, Innovation and Industrial Strategy (BEIS); the Infrastructure and Projects Authority (IPA) and the National Infrastructure Commission (NIC). In year 2 the TIET role will be complemented by a new challenge function that will help to drive change in the sector.

### TIET Chair



**Mike Brown MVO**  
Commissioner,  
Transport for London



**Clive Maxwell**  
Director General,  
High Speed and Major Rail Projects



**Michael Bradley**  
Chief Finance Officer



**Martyn Gannicott**  
Director of Commercial Services,  
Commercial & Procurement



**Stephen Blakey**  
Commercial Projects Director,  
Infrastructure Projects



**Stuart Harvey**  
Major Projects Director



**Alex Lubbock**  
Head of Digital Construction – GCS  
& Manufacturing and Technology  
Lead – TIP



**Sarah Rae**  
Assistant Director



**Fergus Harradence**  
Deputy Director, Construction  
& CLC Board Member



**Catherine De Marco OBE**  
Deputy Director, Infrastructure  
Skills & Efficiency. Leads the Secretariat.



# This report

This is the first annual report on implementing the TIES. It sets out progress against each of the seven TIES challenges, and associated commitments for Year 2 under three broad themes:



## Improving our understanding of costs and performance

Creation of a benchmarking forum to share best practice and innovation (**challenge 3**); and establishing a common approach to cost estimating (**challenge 4**).



## Exploiting digital technology

Exploiting digital technology and standardising assets to enable the adoption of best practice from the manufacturing sector (**challenge 7**); and challenging standards to enable innovation and drive efficiencies (**challenge 6**).



## Enabling delivery

Judging strategic choices and trade-offs (**challenge 1**); improving the way we set up projects (**challenge 2**); and promoting long term collaborative relationships with industry (**challenge 5**).

The TIES challenges are set out in full in Appendix A

Further case studies are provided in the TIES One Year On Report Annex published alongside this report.



Improving our  
understanding  
of costs and  
performance

# Create a transport infrastructure performance benchmarking forum to share best practice and innovation (challenge 3).

TIES has established a benchmarking forum and started to pilot sharing performance and cost metrics across the TIES partners. The forum will be further developed over the coming year to include wider expertise from the academic community and from industry. Partners will develop a shared understanding of costs and performance based on an objective assessment of data. This should harmonise practice, enable culture change; and deliver wider strategic ambitions.

Implementing a benchmarking forum is a complex and iterative process, requiring the alignment of several competing requirements. We have made progress by focusing on key actions. Through a series of workshops, we have begun to explore the best way data and practices can be shared. Efficiency targets need to be met across the partner organisations, and we need an objective method of assessing options through an evidence based methodology.

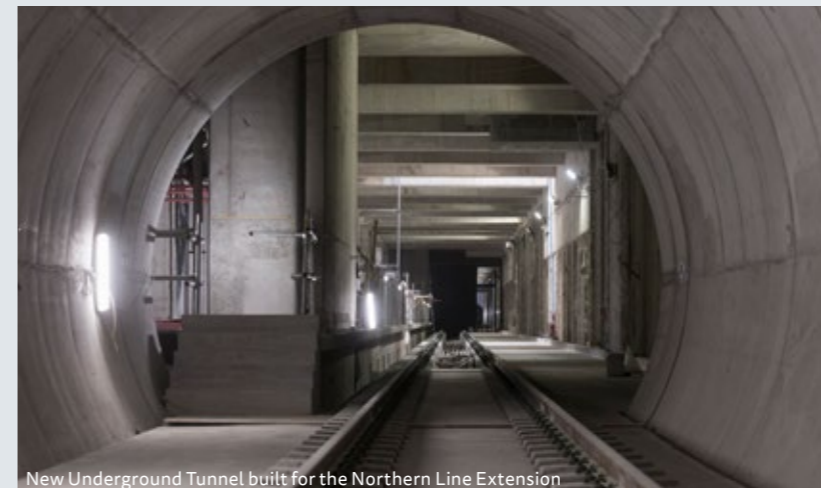
The activities of the benchmarking forum will inform the decision-making processes of the partner organisations. Its outputs will support the effective delivery of current and future capital and operational expenditure efficiency targets. By defining the parameters of collaboration, the TIES benchmarking forum will provide the necessary detail to encourage widespread uptake of 'Best Practice in Benchmarking' as recommended by the IPA.



***We always strive to deliver the highest level of quality as we deliver the government's investment in the strategic road network. By adopting the International Construction Measurement Standards (ICMS) globally recognised standard we will be able to benchmark our projects in an international arena. We're proud to be the first UK infrastructure organisation to do this, which will enable us to lead the way on data sharing and project delivery and getting greater value for the public.***



**Martyn Gannicott**  
Commercial Services Director,  
Highways England



New Underground Tunnel built for the Northern Line Extension

## Collaborating to achieve a common benchmark for tunnelling

In a successful joint initiative between the TIES Partners and the IPA's Transforming Infrastructure Programme (TIP), a data set was collected to inform thinking around a new benchmark for tunnelling. This was the first time public, private and regulated organisations had come together in open forums to share cost and performance data.

The TIES partners, with other key delivery organisations including National Grid and Thames Tideway, along with the British Tunnelling Society, gathered tunnelling data that might help Highways England benchmark key tunnelling projects. Recognising that a lack of data was holding back improved performance and efficiency in major infrastructure projects, the workshop allowed the objective exchange of experiences and open discussion over cost drivers.

From the early stages of the initiative, participants recognised that collaborative information sharing has huge potential to generate value when used effectively.

Participants were motivated by the common goal of a standardised approach to benchmarking to improve communication and understanding around costs and performance.

The pilot forum proved effective at breaking down the silo mentality between organisations. The IPA was able to identify an indicative asset benchmark for tunnelling by identifying key cost drivers. This study will inform future analysis for Benchmarking Indicative Asset Cost (BIAC) of tunnelling assets and Benchmarking Total Design Cost (BTDC).

The benchmarks and data have been published in a report – Case study: *Benchmarking tunnelling costs and production rates in the UK*<sup>2</sup>. The Infrastructure and Projects Authority is looking forward to extending the initiative internationally in collaboration with the Organisation of Economic Co-Operation and Development (OECD).





## HS2 Benchmarking Case Study

HS2 has concluded a comprehensive exercise collecting project cost data from a sample of UK infrastructure projects on general civils, railways and highway type works required for a high-speed railway. The benchmark data was collected to allow HS2 to make an objective assessment of efficiencies and value for money decisions against actual performance data.

The information on 56 different asset and elemental categories is held within a system entitled e-Track. In a coordinated group of information, each group of data is related to another. The e-Track benchmarking suite uses statistical and parametric

dynamic models to produce a range of benchmarks, from unit rates to complete asset costs for major civils and High-Speed Rail.

Collation of the data has allowed the development of an integrated benchmarking database using a strong sample of data from the UK and Europe. The data is a collection of unit cost, elemental, asset and project level metrics, all normalised to a common data set. The metrics generally cover the proposed suite of tactical and operational benchmarks. Strategic metrics have been set by an independent International benchmarking study.

Highways England is adopting International Construction Measurement Standards (ICMS) for all its commercial work, whilst HS2 has mapped its own benchmarking outputs to ICMS. Network Rail has facilitated the development and publication of a Rail Method of Measurement (RMM) that aligns to the architecture of ICMS and has been an ICMS partner since 2016. TfL also uses ICMS.

### How will the TIES partners use the TIES benchmarking forum?

- HS2 will use the forum to inform investment decisions and business cases, making the setting of budgets more stable, and providing the broader portfolio of cross-modal evidence needed to drive greater efficiencies across infrastructure spending on HS2.

- Highways England will use the forum to inform plans to improve its evidence, establish more focused performance requirements, enable better costing and scheduling plans for road improvements, and help to improve its long-term asset management / stewardship.
- Network Rail will use the forum to inform better value for money for the rail network, support comparisons of different operating routes, and identify cost drivers and productivity measures.
- TfL will use the forum to inform investment decisions and drive greater value in delivering its business plan commitments.

# Commitments for year 2

### We will:

1. Build on the benchmarking forum's capabilities by extending its membership to include client, academic and professional communities (summer 2019).
2. Develop and deploy an agreed programme of work for the expanded forum (summer 2019).
3. Use the forum outputs to inform the decision-making processes of TIES partners (ongoing – we will report back in our 'Two Years On' report).
4. Create and harmonise practice, processes and procedures to ensure that relevant data is of high quality and can be shared to promote robust cost challenges (ongoing – we will report back in our 'Two Years On' report).
5. Develop communications to support the aims of TIES benchmarking activities including benchmarking guidance as appropriate at key points in the year.

# Establish a common approach to estimating and cost management to improve cost confidence and assurance (challenge 4).

Improving cost planning capability is fundamental to improving the cost certainty of projects and enabling robust benchmarking activity (TIES challenge 4). A key enabler is the industry wide use of standard language and nomenclature to structure cost data in support of cost models and benchmarking. During 2018, Network Rail delivered on its commitment to formally deploy a standard rail method of measurement (RMM1) across the rail sector. Next year, Network Rail has committed to deploy a second volume (RMM2) that defines the key rail activity cost models.

This year, the TIES partners have collaborated on a maturity assessment of their cost planning capability. Next year we will develop and implement a programme of work to act on the outputs. This activity will be led through the benchmarking forum.

Robust estimates are vital to inform investment decisions through all stages of a project’s lifecycle. Building on a previous assessment in 2014, Network Rail initiated an internal review of its cost planning practices and extended this assessment across TIES partners.

This independent peer to peer benchmarking review highlighted both strengths and perennial challenges faced by the client organisations. Governance, assurance and audit scored well across the partners. However, resources, systems and crucially, data were identified as areas needing improvement.

As a mature organisation, Network Rail was identified as being particularly strong in governance, assurance and process and has led the rail sector by publishing RMM1.



***We need to better understand what infrastructure works should cost, will cost, did cost and why. Challenges 3 and 4 will better equip clients and stakeholders to address these questions.***



**Stephen Blakey**  
Commercial Projects Director,  
Network Rail

HS2 is at the earliest stage of its maturity in many areas, but has set up for success with a focus on processes and assurance.

Highways England’s investment in smart assets and digitalisation has enabled strong performance in quality cost data analytics and benchmarking. Highways England also has an organisational structure and governance process that delivers reliable outputs. It scored the highest on systems and data categories and has the strongest all-round capability.

TfL’s overall capability in cost planning and maturity is similar to that of Network Rail. Both organisations are well placed amongst their peers to share best practice in commercial awareness, decision making and risk management. Moreover, TfL is ‘sector leader’ in its approach to training and mentoring of cost planning practitioners.

In addition to identifying capabilities across the TIES partners, consensus was reached on the need to bring a greater cultural focus on the value of collecting good data.



# TIES partners peer to peer cost planning maturity assessment, 2018

In 2014 Network Rail understood it needed to improve cost planning and estimating and commissioned an independent assessment of its capability. Seeing an opportunity for collaboration, Network Rail invited TIES partners to participate in a peer to peer maturity assessment as part of its own 2018 maturity refresh.

This assessment looked at the maturity and capability across 21 measures and reinforced TIES partners' collective view that the sector's capability is dependent on four key dimensions:

## 1. People

Sufficient numbers of appropriately trained and equipped practitioners who are able to provide a professionally competent service at appropriate costs.

## 2. Process and Governance

Effective process, tools, templates, language and guidance that support high standards, drive consistency and promote a high-quality service offering.

## 3. Systems and Data

Agile, connected and effective systems that aid practitioners and facilitate the compilation of clean data, maintain nomenclature and segmentation to promote clarity and consistency and facilitate effective analysis and benchmarking at appropriate levels of granularity.

## 4. Culture and Capability

A culture that reconciles audit, assurance and governance with appropriate empowerment and accountability to instil individual practitioners with a sense of professional pride and build legitimate corporate confidence that cost planning advice is mature and reliable.

In addition, the assessment has identified two key opportunities:

### 1. People

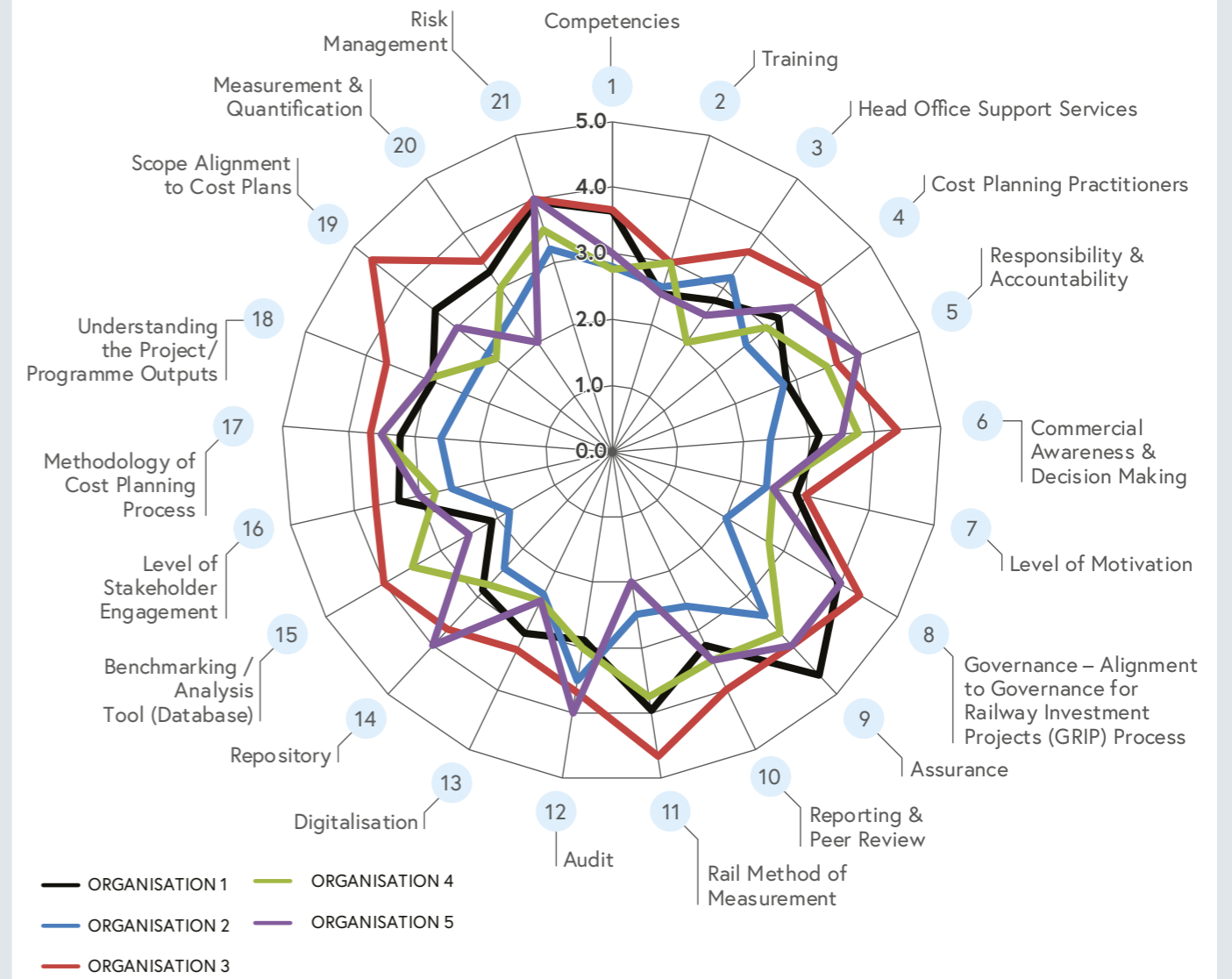
There is a strategic opportunity for TIES to set out a vision for the cost planning profession in concert with the appropriate professional institutions.

### 2. Data

There is a strategic opportunity for TIES to drive a cultural shift in the compilation, sharing and analysis of data to support effective benchmarking.

This approach will enable TIES partners to share good practice and learn lessons on cost planning; informing future activity and efficiency.

## Cost Planning Maturity Assessment – The Detail



# Commitments for year 2

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## We will:

1. Use the outputs of the cost planning maturity assessment to develop and improve our cost planning capability across the TIES partners. Implementation plan in place by spring 2019 supported through TIES benchmarking forum.





# Exploiting Digital Technology

# Exploit digital technologies and standardise our assets to enable the adoption of best practice from the manufacturing sector, such as off-site construction (challenge 7).

The TIES partners are committed to driving efficiencies through digital technology in the design, construction, maintenance and operation of our assets. We have adopted the presumption for offsite construction from the end of 2019, where it provides value for money, together with the Department for Education, the Ministry of Justice, the Ministry of Defence and the Department for Health.

We are working to make the presumption a reality through the cross government modern methods of construction (MMC) working group (to be renamed smart infrastructure working group) led by the IPA. We support this activity through the transport MMC working group established by the TIES partners. This has developed a range of tools through which we are able to assess our maturity and measure progress. Partners will report regularly through 2019.

A number of different terms are used to describe the increasing use of digital technology and manufacturing in construction. These include modern methods of construction (MMC), offsite, smart construction, modular construction, and (platform)-DfMA (design for manufacture and assembly<sup>3,4</sup>). In the TIES programme, we have adopted a broad definition of MMC, reflecting opportunity across the whole life of the asset: "Digital and construction techniques that exploit the benefits of manufacturing processes to plan, design, construct, maintain and operate faster, cheaper and more sustainably".



***At Highways England we recognise the productivity and efficiency challenges that the UK construction industry is facing. In recent years we have encouraged more computer-led design, automation, and pre-assembly across all of our construction activities. As well as driving productivity and efficiency, it improves worker safety and reduces delays and frustration for road users passing through our works.***



**Jim O'Sullivan**  
Chief Executive,  
Highways England

There is a growing evidence base for significant savings from each of the design / construct / maintain phases. The case studies included in this chapter and in the report's annex demonstrate good practice among the TIES partners. Highways England's Rapid Engineering Model (REM) has the potential to reduce design time from months to days in the Smart Motorways Programme. Network Rail's modular stations in west London have already achieved 30% savings in design, with more expected in the construction phase. TfL is using satellite imagery, fibre optics and camera based systems to monitor asset performance during construction, with the potential for savings of £1m when used continuously. TfL has also achieved £0.3m annual savings at St. Paul's station by using sensors to monitor the wear and tear of escalators

and optimise track alignment. HS2 has the potential to achieve significant savings by using a new BIM-integrated tool on its package of main civils works.

Subject to development consent being granted, Heathrow Airport Ltd aims to deliver a significant proportion of the construction of the third runway using offsite facilities or 'hubs'. This presents a tangible opportunity for other clients to participate and to drive demand for offsite manufacturing across the country.

In the coming year, TIES partners will continue to drive uptake and monitor progress through the cross-government smart infrastructure working group and the TIES MMC working group.



REM graphic of emergency refuge areas along a motorway

## Highways England – Rapid Engineering Model for Smart Motorways Programme

The Rapid Engineering Model (REM) is a digital workflow and means that schemes can be designed automatically, allowing Smart Motorways Programme (SMP) schemes to be developed much quicker.

(such as gantries) are automatically generated in line with SMP guidance. The layout can then be optimised using a variety of different design and performance criteria.

Central to the functionality of REM is the SMP design guidance encoded into a rules engine that drives two key aspects of REM – data analytics and automated design. Three-dimensional topographic data is analysed alongside environmental data to help identify opportunities and risks within a specific project, or along an entire asset in the network. Using this data, design layouts of major roadside assemblies

The use of REM has reduced design time from months to weeks and enabled scheme options to be produced and assessed in much shorter timescales. The model can also provide functional support to business operations by providing a data driven approach to asset management.



## Network Rail adopts modular design for west London stations

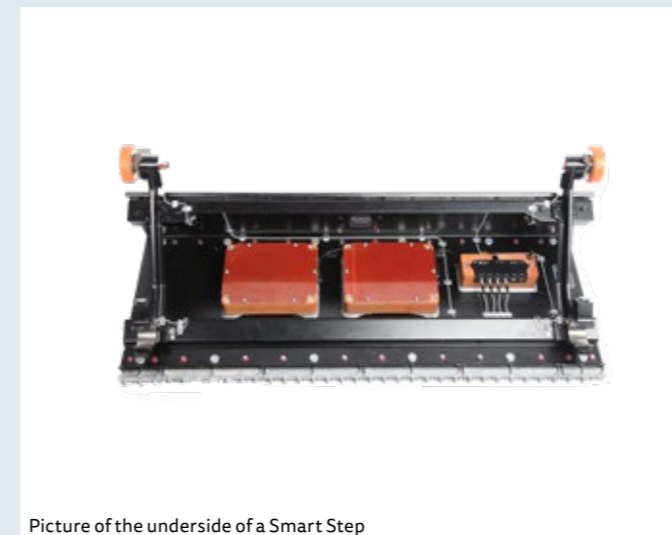
A modular station concept is being adopted for enhanced stations on the Great Western Route, including at Southall, Hayes & Harlington and Ealing Broadway. This approach not only achieves a common look and feel to the buildings, with a consistently high design standard, but also delivers efficiencies for construction and maintenance; providing capital cost efficiencies and longer-term sustainability.

The designs of these upgraded ticket halls are based on proven station layouts encompassing a 'pattern book' catalogue of elements coupled with a standard range of high-quality building finishes.

The use of modules also allows the station buildings to be designed to meet the constraints and requirements of the local situation. Based on a 6x6m grid with a covered public space, this concept is currently delivering efficiency of circa 30% during the design process due to the use of standardised designs. Further savings are expected to be realised during the construction phase.



TfL has been working with its Industry Partner – Cambridge Centre for Smart Infrastructure and Construction (CSIC) and contractor Dragados, to deploy state of the art monitoring technology. Satellite imagery, fibre optic strain sensing, visualisation point cloud, and camera based systems have the potential to enable more efficient construction by delivering detailed data. These serve as an excellent basis for the improvement of current methods of assessment and prediction of potential building damage due to construction-induced ground movements.



Picture of the underside of a Smart Step

SmartSteps is a sensing system developed to monitor the wear and tear of escalator steps to verify component life and optimise component replacement intervals. At St. Pauls station, estimated annual savings due to track realignment optimised by SmartStep data totals £300,000.

## Transport for London Bank Station Capacity Upgrade Project – Research Impact: Application in the Industry.

The innovative and real-time technology installed has also allowed the project to take an informed observational approach and avoided traditional tunnel mitigation measures such as compensation grouting or temporary propping within sensitive built assets which would have been costly and disruptive (savings in excess of £1m).

## Transport for London – Escalator Smart Steps and Technology Driving Whole Life Performance

This system is now being used at other stations. The steps were also used on the Bank Station Capacity upgrade to provide actual measurable data showing impacts on escalators from construction-induced ground movement.



## HS2 and BIM

HS2 is committed to exploiting the potential of digitalisation through harnessing the power of Building Information Modelling (BIM) to design, build and operate the high-speed railway virtually. By adopting the digital way of working with BIM, HS2 believes that it will enable faster more informed decisions to be made, enable stakeholders to have greater visibility, promote collaboration, engender a greater level of trust, provide open communication, and create a cultural shift from document-based drawings to data-driven information sharing.

HS2 is already learning lessons from other major projects and enhancing the use of BIM within the architecture, engineering and construction industry, creating knowledge, skills and experience that can be applied to future projects here and overseas.

The successful implementation of this 'Virtual Railway' or 'Digital Twin' relies on the close cooperation of business functions across HS2 and with its supply chain, innovative use of technology, and fully digitised processes.

Real benefits are starting to be seen throughout HS2 and its supply chain. For example, embedding health and safety information and cost and carbon calculations directly into the virtual railway is streamlining decision making, increasing transparency throughout the design process and making significant financial savings. Other initiatives such as the Virtual Reality (VR) train are providing stakeholders with a view of HS2 in 2026 which has only been imagined before.

TIES partners recognise that the opportunity to maximise value from these innovations is in collaboration. We have considered the first of the infrastructure lifecycle phases – design. Initial analysis shows that by using automated design processes across our programmes, savings of up to £1bn by 2027 could be achieved in the design phase. In 2019, we will work with delivery organisations and funders on further research and development to enable these savings to be realised. We acknowledge that the extent of these savings can vary depending on physical factors such as ground conditions.

The outcome of IPA's call for evidence "Proposal for a New Approach to Building" will provide a valuable data set to support the roll out of a P-DfMA (Platform approach to Design for Manufacture and Assembly) approach in buildings. Initially, government intends to build a market and demand for this approach in social infrastructure. The TIES partners will also seek to use the approach for selected parts of our capital programmes. The recent announcement of £72m for the Core Innovation Hub<sup>5</sup>, will support the piloting of P-DfMA.

TIES partners will collaborate with the Transforming Construction Alliance to support the development and commercialisation of digital and offsite manufacturing technologies through the hub. The partners will work with the Centre for Digital Built Britain to ensure data linked to transport infrastructure can form part of the National Digital Twin recommended by the National Infrastructure Commission.

We recognise the need for a robust, standardised approach to measuring benefits of MMC across all phases of the asset life. Over the coming year, we will work to develop this through our benchmarking forum and Transport MMC working group. We will continue to work collaboratively with government, industry and academic partners.

A number of reports<sup>6,7,8</sup> have identified skills as a barrier to delivering MMC. TIES will work with the Strategic Transport Apprenticeship (STAT) and other initiatives to influence the development of suitable skills.



# Commitments for year 2

## We will:

1. Work with the TIES benchmarking forum and delivery bodies such as i3P and TRIB to further develop our evidence base to:
  - Support the roll out of automated design;
  - Promote construction techniques that exploit manufacturing processes and;
  - Encourage the use of technology to improve asset management capability benefits across the whole life of the asset.  
(Ongoing - we will report back in our 'Two Years On' report).
2. Collaborate with the Transforming Construction Alliance to support the development and commercialisation of digital and offsite manufacturing technologies. TIES partners will work with the Centre for Digital Built Britain to ensure data linked to transport infrastructure can form part of the National Digital Twin recommended by the National Infrastructure Commission. (Ongoing - we will report back in our 'Two Years On' report).
3. Demonstrate our progress in the adoption of MMC from spring 2019 through joint monitoring and reporting.
4. Support development of relevant skills through STAT and other initiatives through the Construction and Rail Sector Deals.  
(Ongoing - we will report back in our 'Two Years On' report)



# Challenge standards to enable innovation and drive efficiencies (challenge 6).

Success in automated design, manufacture and operation is underpinned by our ability to challenge and develop standards that can drive innovation.

The TIES partners have established a collaboration forum to promote a consistent approach to standards. The forum will further explore the integration of standards into the automated design process and the potential for single cross industry standards. Initial areas identified are: drainage, electrical bonding and highway standards.

Two significant initiatives have been progressed to date: Network Rail's standards challenge; and Highways England's standards digitalisation.

Network Rail's standards challenge was developed as part of its Open for Business agenda, following the Hansford review<sup>9</sup>. The challenge aimed to break down barriers and make it easier to introduce new ideas and streamlined procedures into standards. Up to 400 of Network Rail's critical standards have been updated, reducing both complexity and cost. To encourage innovation, suppliers and other stakeholders are now encouraged to put forward better ways of maintaining and enhancing the railway via Network Rail's new standards challenge process.



*We've recently updated our 400 most critical standards, but to ensure they always represent current best practice and constantly strive to safely reduce the cost of the railway, we need the help of our wider industry partners as well as experts from other industries and universities. The launch of the standards challenge process is the lever for this, providing genuine recognition and incentives to propose more efficient ways of both enhancing and maintaining our railway.*



**Jon Shaw,**  
Chief Engineer  
Network Rail



Installation of Series 1 overhead line equipment on the Great Western mainline

## Network Rail's Standards Challenge

The ambition to change culture and behaviours around how standards are developed and implemented is at the heart of the standards challenge process. The process has been developed in partnership with the Rail Industry Association, to improve engagement with the supply chain. The application is subject to a staged evaluation process and an impact assessment is completed across a broad range of outputs such as safety, performance, environment and compatibility.

Careful consideration has been given as to how to incentivise a culture of challenge. One very successful approach has been to include a requirement to identify potential standards challenges within tenders.

### Network Rail experience

Since the launch of the standards challenge in April 2018, there have been 31 applications<sup>10</sup> received all of which have been accepted into the process. Once submitted, the challenge is evaluated by the standard's owner. If accepted, this will result in the standard being updated or a potential derogation provided.

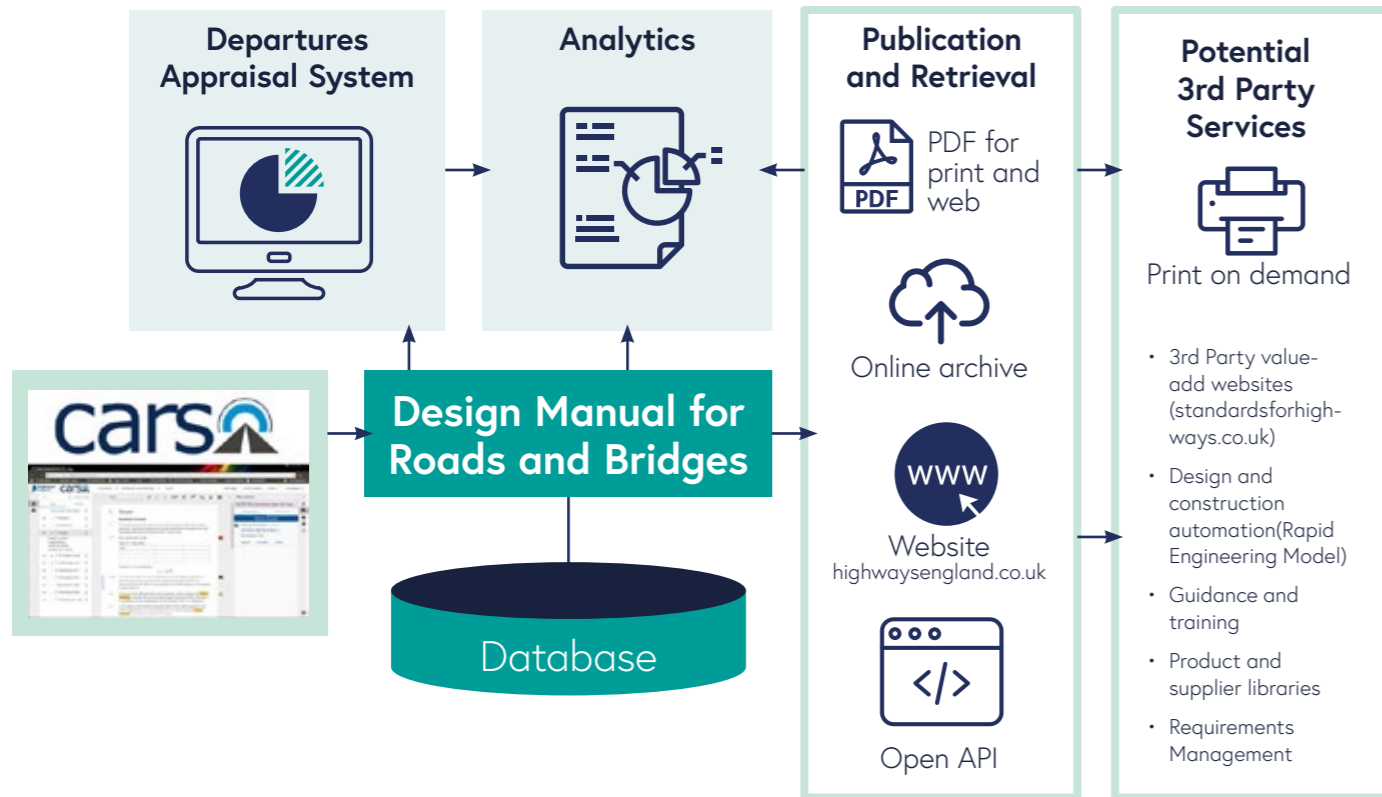
Examples include:

- changing the use of main line design standards for depot track design, offering significant opportunity to make savings through design, installation and maintenance;
- more cost-effective regime for track stabilisation following installation of drainage;
- simplification of the design of overhead line masts to make fabrication up to 50% cheaper and avoid the need to importing structural steel elements from outside of the UK.

Highways England is digitalising the Design Manual for Roads and Bridges in response to the need to future proof its standards. The collaborative authoring and review system (CARS), illustrated below, supports this process and forms part of

a new Technical Standards Enterprise System to both manage standards and provide a number of digital publication options. The digitalised manual will be an enabler for the further development of the Rapid Engineering Model.

**Highways England collaborative authoring tool:** Technical Standards Enterprise System (TSES)



# Commitments for year 2

Through the TIES standards collaboration forum, we will:

1. Build on the initial areas identified (drainage, electrical bonding and highways standards) to identify opportunities to modernise common standards across the TIES partners. A programme of work will be developed and agreed by summer 2019.



Enabling  
delivery

# Judge strategic choices and trade-offs based on whole life costs and wider benefits (challenge 1).

In May 2018 DfT formally adopted revised guidance on capturing wider economic impacts for the purposes of informing investment decisions. The new guidance enhances the way wider social and economic benefits are reviewed when making investment decisions – this ensures they are considered from the very initial stages of policy design. The guidance has been used in the appraisal of a variety of transport schemes in different regions.

The mandatory use of a Procuring for Growth Balanced Scorecard<sup>12</sup> to support contracts greater than £10m is required. A Balanced Scorecard assists in prioritising wider policy objectives such as skills, alongside well-established criteria, such as quality, risk and cost.

DfT will continue to enhance its guidance over the next year. It has recently completed a consultation on themes and priorities to develop the evidence base underpinning its appraisal guidance, including how to assess non-standard schemes, over the next 5 years.

In line with HM Treasury policy, DfT has adopted the '5 case' business case model. To align with TIES, it has reviewed the commercial case guidance within that model. The revised guidance asks that business cases for complex projects indicate that advice has been taken around designing an appropriate, robust and efficient contracting model.



*It is vital that we have a robust understanding of the wide-ranging impacts that transport investment has so that the best investment decisions can be made. Our appraisal framework aims to provide as full a view as possible about the wide range of impacts transport has on the economy, environment and society. Our guidance on how to conduct transport appraisals, WebTAG, draws on best practice in government, academia and industry and we aim to ensure that it reflects the latest evidence and appraisal methodologies.*



**Amanda Rowlatt,**  
Chief Analyst  
DfT

In Year 2, TIES will reinforce this approach by offering a challenge function to projects. We will bring together a panel of experts to provide constructive challenge, to make sure that projects are able to position themselves to deliver in line with the TIES at an early stage in the decision-making process. This will be a voluntary function.

By December 2019, we will also extend the use of benchmarking and enhanced cost-modelling capability to support objective challenge of client costs at an earlier stage in decision making and business case development.

DfT supports innovation through the TRIB. The Board co-ordinates disparate transport research and innovation activities across the UK to achieve a more strategic and collaborative programme of work aligned with national priorities. Through DfT, TIES will work closely with TRIB to support mutual objectives including transport infrastructure: smart, digital, robotic & offsite construction and maintenance, which is being led by Professor Lord Robert Mair, and Mark Thurston, CEO of HS2.



# Commitments for year 2

## We will:

1. Convene a challenge panel of experts to offer a TIES challenge function – operational by autumn 2019.
2. Develop our benchmarking capability to help to inform objective challenge and corroboration of costs at an early stage in decision making and business case development. (Ongoing - we will report back in our 'Two Years On' report).
3. Work closely with the TRIB to support mutual objectives, including on transport infrastructure construction and smart and digital infrastructure. (Ongoing - we will report back in our 'Two Years On' report).

# Improve the way we set up projects to maximise value and prevent inefficiency throughout delivery (challenge 2).

Project delivery frameworks underpin projects and governance across TIES partners. Each partner has its own project lifecycle process. These include: Highways England's Project Control Framework (PCF); TfL's Pathway; and Network Rail's Governance for Railway Investment Projects (GRIP). Many frameworks include integrated benefits management to ensure maximum value and to prevent inefficiency throughout delivery.

The TIES partners' project delivery frameworks align with the principles and methodology set out in the Project Initiation Routemap (2016)<sup>13</sup>, a structured approach to setting up projects for success. Developed by the IPA in collaboration with industry and academics from the University of Leeds and the Infrastructure Client Group, the document provides a valuable tool for public and private sector infrastructure providers. The Routemap offers the basis for sponsors and clients to establish what they need to do to create the appropriate delivery environment for a specific project.



***Project prioritisation, initiation, performance and capability are the basics that we have to get right.***



**Matthew Vickerstaff,**  
Interim CEO,  
IPA



## Infrastructure and Projects Authority: Routemap Case study (Heathrow and DfT)

Since its development in 2012, up to 40 projects (around half being transport related) have benefited from using the Routemap methodology in the public and private sectors. In 2017/18 the Route map team supported projects across transport, energy and regeneration.

In June 2018, Parliament voted in favour of an Airports National Policy Statement (NPS), which paves the way for vital new capacity at a major international hub - Heathrow Airport. The 'Relationship Framework Document', which sets out the nature of the relationship between the Department and Heathrow in relation to the proposed Heathrow Northwest Runway scheme was also published.

This includes an agreement to take forward the IPA Routemap's recommendations on joint working, as well as an intention to carry out a full Routemap study looking wider than governance to other areas of project initiation.

The IPA Routemap team worked with the Department for Transport and Heathrow Airport Limited, using the Routemap methodology to support the design of governance and coordination arrangements for the Heathrow Expansion Programme, post the designation of the NPS.

Although TIES partners have mature project delivery frameworks and governance structures that reflect the principles in the Routemap, it is widely recognised that governance structures alone will not successfully deliver projects. There is need to focus on effective operation, appropriate training and clear responsibilities.

TIES partners are developing their sponsorship capability and governance:

- HS2 has an internal development programme;
- Network Rail, under its *one vision, one way* programme, has established 19 professions, including sponsorship.

- Highways England and Network Rail have both published a sponsorship manual and linked career pathways and training programmes; and
- TfL has a published a sponsorship manual and is currently creating a new directorate that will bring sponsorship together in one place.

The IPA published the Government Functional Standard in October 2018<sup>14</sup>. The purpose of this standard is to set expectations for the direction and management of portfolios, programmes and projects, ensuring value for money and the successful, timely and cost-effective delivery of government policy and business objectives. This document, together with the Project Delivery Capability Framework (2017)<sup>15</sup> and Guide for effective benefits management in major projects (2017)<sup>16</sup> provides a suite of tools to support both clients and the supply chain.

# Commitments for year 2

### We will:

1. Ensure any future review of the IPA Routemap takes account of TIES at the relevant time.
2. Support the implementation of the Project Delivery Functional Standard. (Ongoing - we will report back in our 'Two Years On' report).

# Promote long-term, collaborative relationships with industry to reduce transaction costs in procurement and maximise innovation (challenge 5).

Evidence shows that client bodies can support the supply chain to maximise innovation opportunities and increase productivity through commercial delivery models that promote early collaboration. These models align incentives, and are characterised by more effective management of risk.

Investing in long-term collaboration with the supply chain has been and will continue to be a key focus for the TIES partners. Over the last 12 months, we have seen increased capability from a range of organisations that are recognising the benefits of a collaborative approach, as demonstrated by Highway England’s work on the A14.

## Project 13

TIES partners recognise the positive progress made by Project 13<sup>17</sup>. Network Rail has announced its involvement in the second tranche of early adopters with its three CP6 Track Alliances (Scottish, Central and Southern) projects. The TIES partners will continue to monitor progress on Project 13 and learn from the early adopters.



*At TfL we believe that developing long-term relationships with our suppliers has enabled us to secure better outcomes, and realise efficiencies that would not have been possible otherwise.*



**Stuart Harvey,**  
Major Projects Director,  
TfL



Bridge on A14 under construction

## Highways England A14 Integrated Delivery Team

The A14 Cambridge to Huntingdon improvement scheme was tendered in three discrete packages in 2014, with procurement guidelines that no individual contractor (or joint venture) could be awarded more than two packages.

Following award of the three packages, the four contractors involved (Costain, Skanska, Balfour Beatty and Carillion) agreed that to deliver the scheme in the most cost effective and efficient way, they needed to work collaboratively. Adopting a best person for the job approach across the project, the A14 Integrated Delivery Team (A14 IDT) was created.

To formally reflect the new way of working, a collaboration agreement and deed of variation was drawn up between the contractor joint venture parties and the project design team (Atkins / CH2M). This was not without its challenges but everyone involved was committed to developing an approach

that would deliver efficiencies and effective outcomes for road users. The project has achieved ISO 44001 accreditation for collaborative working; the first stand-alone project to do so. In 2018, the project took a further step on its collaboration journey as the team moved to a new commercial model which aims to deliver the A14 ahead of schedule and within budget.

David Bray, Highways England Project Director said “The team on the A14 have made our collaborative journey one I am very proud to be part of. It’s not all been plain sailing, but by having the genuine desire to do the right thing for the project at every stage we have created something very special. People who visit the project say it feels different, but the fact we now have our ISO 44001 accreditation proves that it’s more than just a feeling, we really have achieved a truly collaborative project that all parties can be justifiably proud to be part of.”



# Project 13 Early Adopters: Anglian Water

Anglian Water's Alliancing journey started in 2004 with the @one alliance, and by 2015 integrated, collaborative delivery models were in place for all parts of the investment programme. Anglian Water is now looking to expand on this approach for delivery of its strategic water resources programme.

Even at this early stage, there is a real sense of opportunity and excitement, particularly around the potential enabled by focussing on outcomes and engaging early. Digital technology plays a big part in this, as does a sound understanding of the range of capabilities needed to deliver.

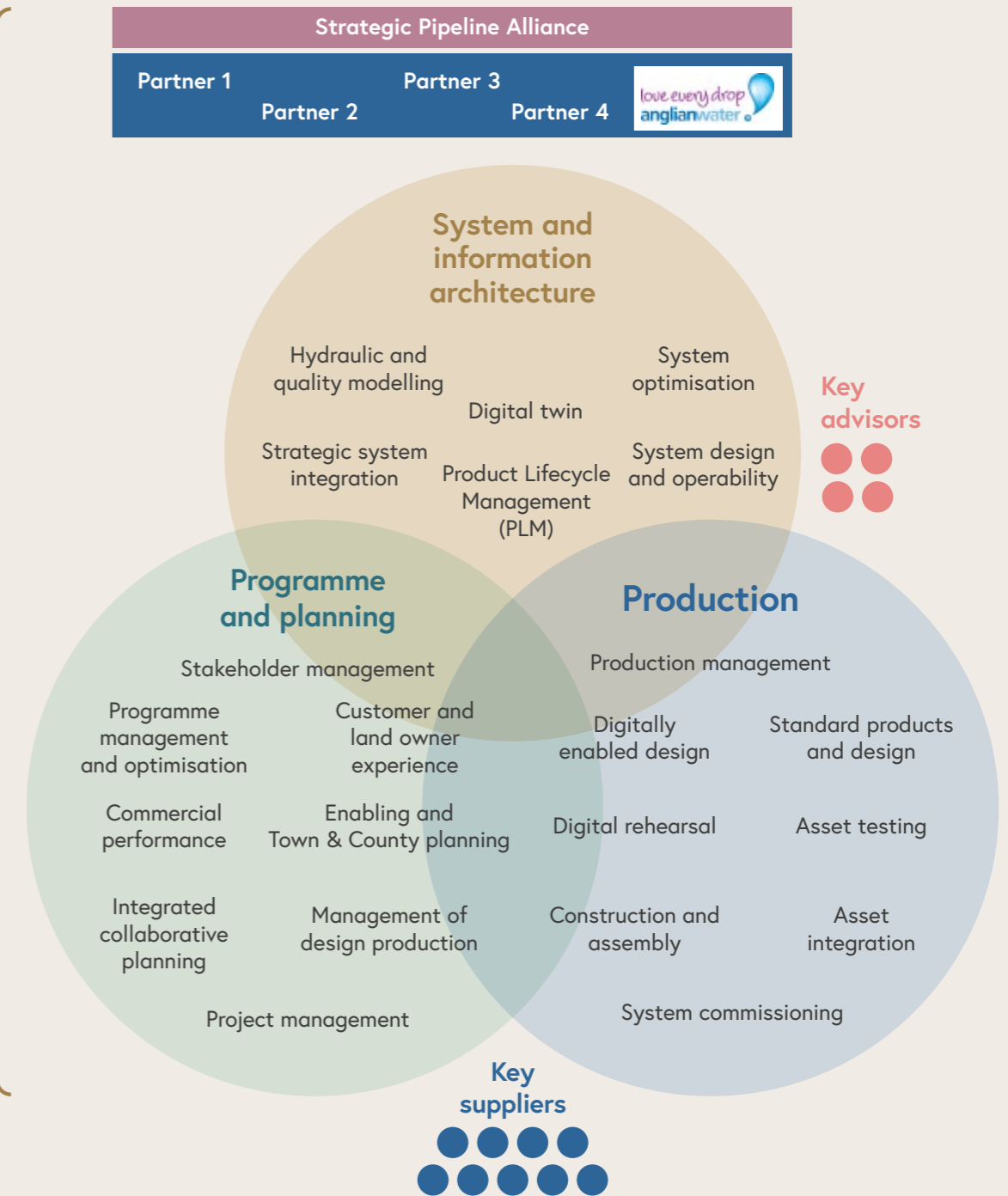
## Strategic Water Resources Programme

As Anglian Water embarks on the creation of a new alliancing enterprise, it is keen to build on its collaborative approach and ensure absolute alignment with a set of clear customer outcomes, particularly in the early procurement stages. As part of building further on its previous alliancing approach, Anglian Water has adopted the following Project 13 principles in a number of areas:

- Focusing on and engaging on customer outcomes.
- Understanding the capabilities that can really add value in delivering these outcomes.
- Developing an integrator role accordingly.
- Developing commercial models that reward out-performance, not work.

Simple incentivised commercial contracts and mechanisms that drive the right behaviours and reward out-performance, are also vital to setting up a truly leading enterprising arrangement. This will also be essential in stimulating innovation and developing of new skills.

Integrator



The diagram illustrates the integrator as a co-dependent organisation in order to enable a true Project 13 Enterprise approach.

TIES partners are working with DfT commercial teams, the IPA and Crown Commercial Service (CCS) to encourage Project 13 principles or other similar progressive delivery models to drive innovation.

# Commitments for year 2

## We will:

1. Build a body of evidence on the key enablers and the added value of successful collaboration (Ongoing - we will report back in our 'Two Years On' report).
2. Work with Project 13's 'early adopters' to understand how enterprise models can reduce transaction costs in procurement; and with IPA and CCS to encourage Project 13 principles or other similar progressive models to drive innovation. (Ongoing - we will report back in our 'Two Years On' report).



*HS2 is the leading infrastructure project in Europe and one that will deliver benefits across the UK. To maximise its potential, HS2 remains committed to the ideals set out within the TIES strategy. Throughout 2018 we have made major steps forward in achieving its goals, through proactive engagement with the supply chain, driving innovation through I3P and realising the potential that digitisation and benchmarking can deliver. Our determination to work with colleagues across the DfT 'family' to achieve the TIES commitments for 2019 will enable us to increase our efficiency of delivery, and help us to us to further support our vision of being a high performing, innovative organisation, which will deliver a high-speed rail network for the country.*



Mark Thurston  
Chief Executive Officer  
HS2



*TIES is an important opportunity to harness the collective capability of key organisations across the UK transport infrastructure portfolio. Network Rail is fully committed to supporting TIES and will be active across the seven challenges, with an immediate focus on cost and performance benchmarking.*



Andrew Haines OBE  
Chief Executive Officer  
Network Rail

# Year 2 – Commitments

We have made progress our first year and this will provide a platform for our commitments in Year 2. Progress against all of these will be reported in our 'Two Years On' report.

## The Taskforce



Year 2 Commitments	Target Date
Announcement of new TIET Chair	Spring 2019
Announcement of new TIES Partners	Summer 2019

## Understanding cost and performance



Year 2 Commitments	Target Date
Build on the benchmarking forum's capabilities by extending its membership to include client, academic and professional communities.	Summer 2019
Develop and deploy an agreed programme of work for the expanded forum.	Summer 2019
Use the forum outputs to inform the decision-making processes of TIES partners.	Ongoing
Create and harmonise practice, processes and procedures to ensure that relevant data is of high quality and can be shared to promote robust cost challenges.	Autumn 2019
Develop communications to support the aims of TIES benchmarking activities including benchmarking guidance as appropriate at key points in the year.	Ongoing
Use the outputs of the cost planning assessment to develop and improve our estimating and cost planning capability across the TIES partners. Implementation plan in place by target date supported through TIES benchmarking forum.	Spring 2019

# Exploiting Digital



Year 2 Commitments	Target Date
<p>Work with the TIES benchmarking forum and delivery bodies such as i3P and TRIB to further develop our evidence base to:</p> <ul style="list-style-type: none"> <li>• Support the roll out of automated design,</li> <li>• Promote construction techniques that exploit manufacturing processes and</li> <li>• Encourage the use of technology to improve asset management capability benefits across the whole life of the asset</li> </ul>	Ongoing
<p>Collaborate with the Transforming Construction Alliance to support the development and commercialisation of digital and offsite manufacturing technologies. TIES partners will work with the Centre for Digital Built Britain to ensure data linked to transport infrastructure can form part of the National Digital Twin recommended by the National Infrastructure Commission.</p>	Ongoing
<p>Demonstrate our progress in the adoption of MMC from target date through joint monitoring and reporting.</p>	From spring 2019
<p>Support development of relevant skills through STAT and other initiatives through the Construction and Rail Sector Deals.</p>	Ongoing
<p>Building on the initial areas identified (drainage, electrical bonding and highways standards), identify opportunities to modernise common standards across the TIES partners – a programme of work will be developed and agreed by target date.</p>	Summer 2019

# Enabling Delivery



Year 2 Commitments	Target Date
<p>Convene a challenge panel of experts to offer a TIES challenge function</p>	Operational by autumn 2019
<p>Develop our benchmarking capability to help inform objective challenge and corroboration of costs at an early stage in decision making and business case development.</p>	Ongoing
<p>Work closely with the TRIB to support mutual objectives, including on transport infrastructure construction and smart and digital infrastructure.</p>	Ongoing
<p>Ensure any future review of the IPA Routemap takes account of TIES.</p>	At relevant time
<p>Support the implementation of the Project Delivery Functional Standard.</p>	Ongoing
<p>Build a body of evidence on the key enablers and the added value of successful collaboration.</p>	Ongoing
<p>Work with Project 13's 'early adopters' to understand how enterprise models can reduce transaction costs in procurement; and with IPA and CCS to encourage Project 13 principles or other similar progressive models to drive innovation.</p>	Ongoing

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# Appendix A

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## TIES Challenges

### 1. Judge strategic choices and trade-offs — based on whole life costs and wider benefits.

“Investment decisions need to be based on the value of whole life cycle costs and benefits including consideration of broader outcomes such as building skills and capacity within the supply chain, innovation, regional re-balancing and clean growth. Advice to Ministers, investment boards and sponsors needs to enable them to judge strategic choices and trade-offs within portfolios. By providing whole life cost information, more effective decisions can be made about how to balance short and long-term trade-offs, including disruption to our transport network.

### 2. Improve the way we set up our projects — to maximise value and prevent inefficiency throughout delivery.

“Projects must have clear objectives, defined sponsor remits, defined delivery structures and the capabilities needed for clear governance if inefficiency during the later design and construction stages is to be avoided. Greater consistency and a higher degree of assurance needs to be provided to governance boards at initiation stage about how projects will be managed to cost and time, whilst securing defined outcomes. Building internal capabilities within transport bodies around sponsorship, intelligent clienting, commercial and risk management and project delivery are crucial. As is empowering sponsors and clients to challenge and be accountable for the successful delivery of projects. The government will also continue to support a system of independent economic regulation, recognising the role this plays in driving efficiency”.

### 3. Create a transport infrastructure performance benchmarking forum to share best practice and innovation.

“Investment decisions need to be informed by high-quality performance data from similar comparable domestic and global projects. Accurate and complete project performance information provides better assurance of what projects are likely to cost and helps identify driver of cost in individual projects, which in turn can highlight best practices and drive innovation.”

### 4. Establish a common approach to estimating and cost management to improve cost confidence and assurance.

“Cost estimates are a critical input into effective decision making. Sponsors need an approach to estimating that enables them to make value-driven decisions, balance trade-offs and risk, and enable them to manage projects to cost. Robust and consistent estimates will better facilitate this. Equally, estimators need to be able to draw on a range of benchmarking techniques to produce robust estimated ‘should costs’. To drive change and create a culture of cost-led design, capability in estimating and cost planning services need to be priority”.

### 5. Promote long-term, collaborative relationships with industry to reduce transaction costs in procurement and maximise innovation

“The way that transport bodies are set up to engage with the supply chain defines how suppliers subsequently structure themselves for delivery. Shifting practices away from asset-focused transactional contracts towards collaborative approaches, such as alliancing, will require effort and commitment. Transport bodies can support the supply chain to maximise innovation opportunities and greater productivity through delivery models that promote early collaboration, align incentives, offers strong leadership and are characterised by more effective management of risk. The structure of the supply chain will also impact on aspects of delivery like bid, transaction and overhead costs, which occur at each level of the supply chain and are ultimately paid for by the client”.

### 6. Challenge standards to enable innovation and drive efficiencies.

“The safety of transport users and those who work on the infrastructure is paramount and standards help us achieve this. Standards provide a framework and the ability to manage safety and technical risks in the design, construction and operation of transport infrastructure. Standards prevent short-term imperatives from resulting in longer-term operational cost or unacceptable asset performance. However, whilst standards must address our core statutory, regulatory and performance requirements, they should not stifle innovation or efficiency. The supply chain should be supported to develop new solutions and not held back in terms of innovation by historical norms”.

### 7. Exploit digital technologies and standardise our assets to enable the adoption of best practice from the manufacturing sector, such as off-site construction.

“Digital technology and lessons from manufacturing present considerable opportunities to industry to innovate, invest and upskill in order to boost productivity. Suppliers need to be supported and incentivised to accelerate the use and application of Building Information Modelling (BIM) and digital technology in the design and project delivery of transport infrastructure. Digital tools will enable the more extensive adoption of modern construction methods, such as off-site construction and standardisation of assets, which will unlock industrial capacity across the UK”.

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3. P-DfMA describes the process by which building products or components are digitally designed across multiple types of built assets in a way that enable them to be made on large scale using machinery and put together in one place. This is the approach to buildings set out in the IPA's November 2018 Call for Evidence – Proposal for a New Approach to Building.
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# Acknowledgement

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## TIES Secretariat

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# Design

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