



Transport Infrastructure Efficiency Strategy

One Year On Report:

Annex

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HS2





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Improving our
understanding
of costs and
performance

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

The ability to collect and assess cost information in a common format is a key requirement in benchmarking. The following case study illustrates how Transport Infrastructure Efficiency Strategy (TIES) partners are aligning measurement methods to address this need.

International Construction Measurement Standards (ICMS)

As property, construction and infrastructure continues to be increasingly global in extent and operation, there is a real need for international consistency in something as fundamental as construction cost classification. Historically, these processes have followed local and regional custom and practice, which has made comparison across the world more difficult, leading to confusion, uncertainty and lack of confidence from key stakeholders.

ICMS is a principles-based international standard that sets out how to report, group and classify construction project costs in a structured and logical form. Under the stewardship of the Royal Institution of Chartered Surveyors (RICS), the standard has been written by a group of independent industry group of more than 40 professional and not-for-profit organisations from

around the world, working together to develop and implement international standards for benchmarking, measuring and reporting construction project cost. It is considered to be the first step in creating a seamless, global, pyramidal hierarchy of construction cost classification: from high-level global cost benchmarking to granular, local cost measurement.

Highways England is adopting the standard for all its commercial work, whilst HS2 has mapped its own benchmarking outputs to the standard.

Network Rail has facilitated the development and publication of a Rail Method of Measurement (RMM) that aligns to the architecture of ICMS.

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

The following case study illustrates how one TIES partner has been working to improve cost estimating capability.

Network Rail cost planning maturity assessment

In 2014 Network Rail undertook a third-party assessment of its internal estimating process and capability, covering its people, processes and systems.

It recognised it needed to improve the accuracy and granularity of estimating data to demonstrate efficiency and value for money with the knowledge that estimating was becoming more formalised and digitalised with robust processes required to appropriately manage the level of risk at the various project programme gateways without compromising safety.

The intention was to answer three key questions with appropriate levels of certainty:

1. **What should it cost and why?**
To support early investment decisions
2. **What will it cost and why?**
To support commercial stewardship during detailed design and implementation
3. **What did it cost and why?**
To demonstrate value for money, identify cost drivers and future efficiencies, confirm actual return on investment and through benchmarking, inform future investment decisions.

The assessment identified four 'dimensions' in respect to cost planning:

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

2. **Process**
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**
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.

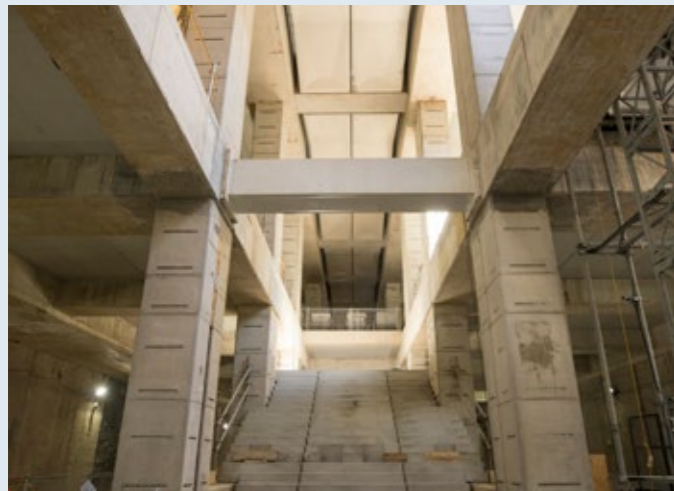
This measurement against a maturity assessment has allowed Network Rail to improve, with the rationalisation of its estimating systems, and development of its people and improvement in process, in line with those deemed 'best in class'. In 2018 the cost planning maturity assessment was repeated and expanded to include the other TIES partners.



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).

TIES partners are adopting best practice from the manufacturing sector to drive efficiencies – Transport for London (TfL) and Highway England’s case studies below demonstrate the benefits of modern methods of construction (MMC).



Transport for London – Northern Line Extension

Transport for London (TfL) contractors are using MMC to deliver the Northern Line Extension (NLE) project exploiting the benefits of BIM technology libraries of modular components, which are prefabricated in factories and assembled on site.

The Ferrovial Agroman Laing O’Rourke (FLO) joint venture and designer Mott MacDonald produced designs which make maximum use of prefabricated components in the construction of the extension’s new stations. These include:

1. Precast platforms on Battersea and Nine Elms (over 800 units in total);

2. Precast beams at Battersea and Nine Elms, including exposed finish beams at Nine Elms;
3. Exposed finish coffered soffit panels at Battersea above the main public areas, which were suspended in place, rather than propped, before they were cast into the structure;
4. Electrical cable management modules;
5. Roof structure for the Eastern headhouse at Battersea (main entrance).

In addition, TfL has precast concrete staircases, and lattice slabs which form the soffits at Battersea and Nine Elms. This has helped to eliminate wastage of materials associated with conventional construction methods, deliver a higher quality and more consistent product and helped to minimise the resources required on site. It proactively reduces the health and safety risks.



Standard bridges adopted in Highway England's Regional Investment Programme

Highway England is developing ways to deliver cost and programme efficiencies by reviewing the standardisation and modularisation of products on its network. Design and construction of new bridges is a major part of this and as such, a study has been undertaken to identify opportunities for bridges and plan how to deliver future development across the Regional Investment Programme (RIP).

Unlike other asset groups on the highways network, such as gantries, the design and construction of bridges is more complex. They are typically governed by a unique set of loading, geometric and geotechnical constraints at each required location. A total of 86 new structures, and within this two distinct groups of structures with similar geometric constraints have been identified that could provide a suitable opportunity to develop a standardised solution. These account for up to 25% of the overall programme requirements. It has been found that the adoption of standardised bridge designs should enable savings of around 20% of design and construction costs.

On the A14 Cambridge to Huntingdon scheme, eight bridges which had been designed with length, span and construction methods to suit their individual locations were re-evaluated to take a modular approach to the design. A move from 3 span structures to 2 span structures gave the opportunity to adopt standardised elements allowing pre-fabrication in a ‘flying factory’ on site rather than construction at location, improving control over quality and measurement and reducing the risks to operatives of working at height. This change also provided efficiencies through reduced earthworks and a reduction in whole life cost of maintaining the structures.

Developing logistics hubs and using production facilities to support offsite construction are now underpinning the delivery of a number of major

projects. The following case studies illustrate how Heathrow Airport Ltd plan to use this approach.



is taking place early so that the logistics hubs, and their local supply chains, can influence the design of the project and Heathrow's procurement strategy

As the programme design develops the purpose of the facilities will become clearer. There are three different potential uses of the logistics hubs:

1. **Consolidation**
Where products come into the facility from multiple suppliers and are then transported to site in a way to maximise utilisation of transport best as possible.
2. **Configuration**
Where products come into the facility from multiple suppliers and are then re-packed into 'work-packs' in a way to provide operatives on site all the products they need to deliver their works.
3. **Pre-fabrication / Pre-assembly**
Where products come into the facility and are pre-assembled into modules. The modules are then transported to site.

The greatest value that could be achieved is pre-assembly, with the added advantage of taking hot and wet trades offsite and performing them in a factory environment with all the added benefits of better health and safety, quality and productivity.

Highways England and others have approached Heathrow to explore the potential of the hub facilities to be utilised once the expansion programme is complete, to ensure a legacy for these hubs and their surrounding communities.

Heathrow Hubs

To deliver the expansion programme, Heathrow has committed to use logistics hubs around the regions and nations of the UK, in order to maximise procurement, spend outside of London and the South East, and build a nationwide supply chain. It is likely that there will be four hubs (with one in Scotland, as committed to in the airport's MoU with the Scottish Government) and these hubs will preassemble and consolidate components offsite before transporting them to the main construction site. There will be a consolidation hub at Heathrow, where some products will be taken through security so they can be assembled on site.

Heathrow went to market for Expressions of Interest in April 2017, and a longlist was announced in November 2017. In the first half of 2018, Heathrow visited all 65 sites on the longlist and a Pre-Qualification Questionnaire (PQQ) was opened to the longlisted sites in November 2018. Following the PQQ, a short list of sites will be announced in spring 2019, with the successful final sites announced in early 2020. Selection

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

The Infrastructure Industry Innovation Platform (i3P) community is providing leadership and driving innovation across the infrastructure industry. The following case study shows how an evidence base can be established to challenge current industry standards to the benefit of the wider construction industry.



i3P case study (Zone of Influence: Improving Industry Standards for Large Diameter Shafts)

It was believed that current industry standards for asset protection resulting from ground movement during the construction of large Diameter Spray Concrete Lining Shafts (greater than 17m diameter) were overly conservative, due to a lack of case history data. This has a significant impact on assurance, monitoring and mitigation costs as the client seeks to gain the necessary consents. It potentially also causes unnecessary disruption to third parties.

Jointly funded between i3P and Thames Tideway, the project required detailed monitoring at Tideway's Carnwath Road site to measure actual ground movement as the 26m diameter shaft was constructed. This was undertaken by installing bespoke monitoring points and innovative Light Detection and

Ranging (LiDAR) techniques. Initial findings suggest a zone of Influence of approximately 63m rather than the industry standard of circa 100m (New and Bowers 1994) which reduces the area by approximately 60%. The findings will be submitted for peer review during late 2018 and be ready for publication in 2019, with the opportunity to reset standards across the industry.

The case study carries potential benefit for current and future projects enabling more focussed engagement with property owners in a reduced zone of influence and demonstrates the validity of new LiDAR methodology for monitoring ground movement



**Enabling
delivery**

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

The ability of major infrastructure projects to facilitate wider social and economic benefits is now a key consideration when investment decisions are made. The following case studies provide some examples.



Northern Line Extension (NLE)

TfL's plans to extend the Northern line to Battersea will:

- Support the building of 20,000 new homes, create 22,000 construction jobs and support 25,000 new jobs up until 2027.
- Create two brand new stations at Nine Elms and Battersea which are linked to existing bus routes, transforming local connectivity. The development is served by routes 156, 344 and 436. The 436 was re-routed to serve Nine Elms Lane and Battersea Park Road in November 2016 to give better connectivity between inner south London and the development area, and to give additional capacity between Vauxhall and Battersea.
- Improve tube access for people living in the area. Bringing Nine Elms and Battersea within 15 minutes of the West End or the City.

- Support the transformation of Vauxhall, Nine Elms and Battersea, a designated regeneration area on the South Bank.
- Improve public spaces in the area, in conjunction with other schemes (Vauxhall Cross gyratory and Nine Elms), which will help to create a more pleasant corridor for cyclists, pedestrians and bus passengers.
- Reduce pressure on other parts of the transport network, including Vauxhall station.

Apprentices and skills:

Since work started:

- 47 Apprentices have been employed on project.
- 123 job starts for those previous unemployed, sustaining employment for 26 weeks, of which 69 were from London.
- 1519 days of work experience provided for undergraduates, school/college students and education pathways programmes.
- 75 school engagement days delivered including site tours, careers events and school activities.

The project team has also offered placements in commercial, project management and engineering as part of the TfL graduate and apprentice programme.



Barking Riverside extension

The vital transport infrastructure needed to support the development of one of Europe's largest brownfield sites moved a step closer, as Transport for London (TfL) awarded the contract to a joint venture of Morgan Sindall Construction & Infrastructure and VolkerFitzpatrick (MSVF) to extend the London Overground to Barking Riverside.

The 4.5km extension of the Gospel Oak to Barking line, one of the major projects in TfL's Business Plan, is an intrinsic part of the Barking Riverside development, a 180-hectare site on the northern bank of the River Thames that will become home to one of London's most significant housing developments.

The delivery of the extension will support up to 10,800 new homes and will unlock a wide range of benefits in the local area, including a new school and healthcare facilities and the construction of a new district centre with commercial and leisure facilities. As many as 50 per cent of the new homes could be affordable, helping to tackle London's housing shortage crisis.

Preparation work for the extension will commence immediately, with main construction due to start in early 2019 and train services commencing from late 2021. Under the contract, MSVF will deliver:

- A 4.5km extension to Barking Riverside, from the Tilbury Loop Line between Barking and Dagenham Dock stations to Barking Riverside
- Reconfiguration of Network Rail's Ripple Lane goods yard to allow the extension to connect to the Tilbury Loop
- Construction of a viaduct over the Ripple Lane yard. This will require the viaduct to be built over the Tilbury Loop and foundations constructed between the HS1 tunnels
- Continuation of the viaduct for a further 1.5km over Renwick Road and into the heart of Barking Riverside
- Construction of a new terminus station within the Barking Riverside town square. The station will have step-free access from street to train.

The London Overground extension will deliver a sustainable public transport alternative to car travel and link Barking Riverside into London's wider public transport network through connections at Barking, with District and Hammersmith & City services and c2c services to London Fenchurch Street and Essex.

The service will operate with four trains an hour and feature electric London Overground trains with air-conditioning and walk-through carriages, for customer comfort.

The London Overground extension to Barking Riverside is an important part of TfL's Business Plan and the Mayor's Transport Strategy which plans to create a fairer, greener, healthier and more prosperous city by improving public transport and encouraging active travel.



HS2 – manufacture and assembly of modular components creates jobs

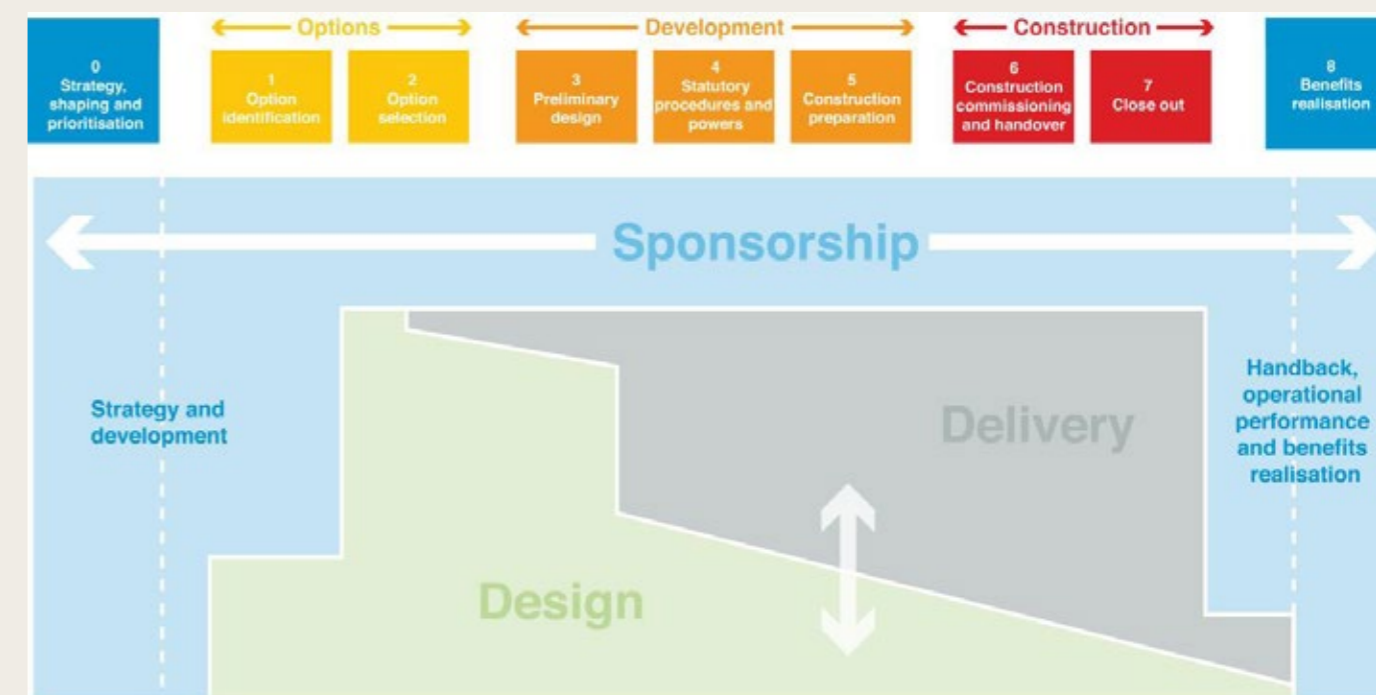
The HS2 programme is set to provide a boost to the Explore Manufacturing factory. The factory has won a contract with joint venture (Laing O’Rourke and Murphy) to supply major bridges as part of the early works on phase one of the project. The modular components will be manufactured at Explore Industrial Park in Worksop, North Nottinghamshire and then brought to site in the West Midlands for assembly. The deal is expected to create 35 new jobs at the company, which also recruits a minimum of four apprentices a year.

Alan Clucas, director of Explore Manufacturing, said: “We are proud to be working on the biggest rail infrastructure programmes in the country. For Explore Manufacturing it means a significant contribution in digital design and high-quality offsite manufacturing, which shortens time needed on site, and has big benefits in safety, efficiency and programme costs.”

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

The following case studies illustrate how TIES partners are developing the skills and capability to deliver projects more effectively.

Highways England – Launch of its Sponsorship Manual



Sponsorship has long been recognised as essential to the successful delivery of infrastructure projects and programmes. It is seen as particularly valuable for driving project performance and outcomes in a broad range of DfT and other transport-related programmes.

Highways England formally introduced the function in 2017. Further embedding and extending sponsorship is underpinned by active support from the Highways England Executive for developing sponsorship as a distinct profession within Highways England, separate to, but complementary to the project delivery profession.

The manual is designed to be accessible and valuable to all Highways England employees. It serves as an

introduction and reference guide for sponsors, delivery teams and their stakeholders.

In the Foreword to the manual Peter Mumford, Major Projects and Executive Director, Capital Portfolio Management and Elliot Shaw, Strategy and Planning Executive Director state:

“Sponsorship is a critical function for Highways England to enable us to achieve our objectives and efficiency goals. The focus on developing and specifying the right things; and ensuring we achieve our aims and end results is paramount to delivering project and programme success. Our aim is to grow and harness the specialist skills and experience of our sponsors to bolster the efforts and capabilities of all our people.”

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

The following case studies illustrate how TIES partners are working further in collaboration with their supply chains.



Effective Alliancing Enablers – Network Rail Infrastructure Projects

Network Rail has used different collaborative models across a number of programmes and regions which have adopted varying degrees of risk sharing, integration and success. The selection of the type of delivery model or contracting model to deploy must be driven by the stakeholder needs, procurement strategy, and strong collaborative leadership.

In March 2017, Network Rail launched its Collaborative Refresh Strategy. This was designed to re-engage key stakeholders and practitioners to bring greater consistency across the business through regularising corporate processes, systems and capabilities.

Building on the accreditation to ISO 4001, the International Standard for Collaborative Working, this strategy has ensured that collaborative process and capability expectations are now embedded across Network Rail's Infrastructure Projects division.

Network Rail has also carried out a review of its key collaborative programmes and published a freely available report on 12 key enablers to successful alliances.

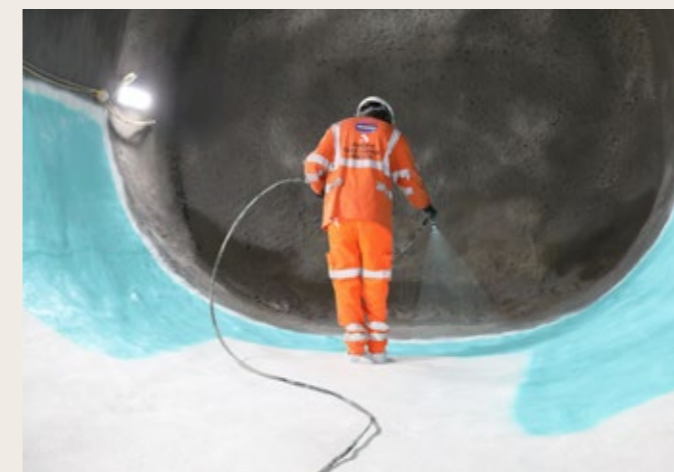
Transport for London: Conflict Avoidance Panel

Transport for London (TfL)'s strategy to ensure proper administration of its contracts underpinned by collaborative approach is paying dividends. This strategic and commercial approach has enabled TfL to review and analyse contract risk and improve decision making with changes to the terms and conditions of our contract that ensure certainty and protect delivery.

An example is the introduction of a 28-day period to disagree with a Project Manager's assessment; this increases commercial certainty in the delivery of projects spanning many years and reduces disruptive commercial behaviours over the life of their projects.

TfL has also introduced in its contracts the innovative Conflict Avoidance Panel that has been developed by TfL in collaboration with the RICS and the supply chain. This has enabled the early resolution of potential issues and disputes using a flexible process at a much lower cost - both financially and of team morale - than adjudication.

The Panel Partners are chosen in agreement by the parties from a list managed by the RICS of diversely skilled and experienced professionals, enhancing the quality of the decision making and reduction of conflict on completion of the contracts.



Bank Station Upgrade – Innovative Contractor Engagement (ICE) Approach

The progress to date indicates a more "effective product" and an efficient delivery method underpinned by a collaborative approach which proactively seeks to identify risks and jointly work together to mitigate them. The programme continues to be delivered at pace and key to this has been the way the project was initiated and strong collaborative operating model that was deployed right from the outset.

Tunnelling works are progressing with 80 per cent of the new Sprayed Concrete Lining (SCL) tunnels now complete. This has allowed the project to commence the waterproofing of the new tunnels ahead of schedule starting in the new Central line moving walkway link. The early completion of this work is a prime example of how collaborating with the supply chain has worked to the benefit of all. Working with our Design and Build contractor, Dragados, the project has engaged Tier 2 suppliers into the design process much earlier in the project lifecycle than is typical on a large infrastructure project.

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