



HM Treasury

# National Infrastructure Plan for Skills

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September 2015





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# Foreword

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Delivering our ambitious infrastructure investment programme is a key enabler of our long-term economic plan. This investment will bring jobs and growth to all regions of the United Kingdom, essential to rebalancing our economy.

But we face challenges to ensure that we can build a skilled and productive workforce to deliver these plans. And it's not just more skilled people we need, it's also a different blend of skills.

This report sets out the results of detailed analysis and modelling of the £411 billion National Infrastructure Pipeline and describes the key challenges faced by sectors and regions.

Government is already taking action to address these challenges. We set these plans out in *Fixing the Foundations: Creating a more prosperous nation*. This included the commitment to 3 million apprenticeship starts this Parliament, a vision to refocus vocational provision, simplifying and streamlining the number of qualifications and a network of prestigious technical institutes to deliver high-standard provision.

These actions will help address some of the longer term challenges. But today, as investment levels build, the demands on the workforce grow. We are already seeing shortages of skills in some key sectors and specialist trades.

So we want to do more to assure the delivery of our infrastructure plans. We want to work with regions to build greater understanding of local demands and take action to address shortfalls in capacity. We want to encourage greater diversity in the workforce. And we want to build more transferable skills to enable workers to take advantage of the many opportunities this investment will deliver.

This report is just the first step. It sets out the scale of the challenge. Over the coming months, we will consult with stakeholders across industry, government, academia and training providers to build a series of detailed actions to address the skills challenge.

I would like to express my thanks to Dr Diana Montgomery, Chief Executive of the Construction Products Association, for chairing a cross Whitehall-industry steering group on behalf of Infrastructure UK to develop the findings of this report.



Lord O'Neill

Commercial Secretary to the Treasury



# Executive summary

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Investment in infrastructure is a vital element of improving the UK's productivity. With infrastructure output in the UK predicted to continue to grow,<sup>1</sup> government and industry need to work together to ensure we have the right people with the right skills to deliver the ambitious pipeline of £411 billion of planned public and private investment to 2020 and beyond. This growth is happening in an increasingly competitive global infrastructure market.

The government has already set out plans to drive investment in skills, another vital component to delivering higher productivity in the UK. *Fixing the Foundations*<sup>2</sup> outlined the government's commitment to **increase the quantity and quality of apprenticeships in England significantly to 3 million starts this parliament**, including rolling out Degree Apprenticeships, to provide the skills the economy, infrastructure and employers need.

This government has also committed to:

- **enshrine the 3 million target in law;**
- **set targets for public sector bodies to contribute to the 3 million target;**
- **abolish employer NICs for almost all apprentices under the age of 25 from April 2016;** and
- **enshrine the term 'apprenticeship' in law** to protect the brand and recognise apprenticeships as a career path equal to higher education.

All employers will need to play their part in making this happen. In recognition of the genuine step-change needed in quantity and quality, the government **will introduce a levy on large employers to fund the new apprenticeships**. The formal consultation with business on the implementation of the levy was launched in August and runs until 2 October 2015. It is expected to be operational by April 2017.

*Fixing the Foundations* also describes the government's ambition to deliver clear, high-quality professional and technical routes to employment through:

- **simplifying and streamlining the number of qualifications** so individuals have a clear set of professional and technical routes to choose from;
- **refocusing vocational provision** to deliver the high-quality skills at intermediate and higher levels that employers need; and
- **establishing a network of prestigious Institutes of Technology** to deliver high-standard provision at levels 3, 4 and 5, sponsored by employers, registered with professional bodies and aligned with apprenticeship standards.

As part of its wider devolution agenda, the government will ensure that better targeted vocational training is responsive to local employer needs and priorities. The government is committed to strong local areas and employers taking a leading role achieving its vision for the post-16 skills system. Detailed measures for these objectives are set out in *Fixing the Foundations*.

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<sup>1</sup> Construction Products Association - Construction Industry Forecasts 2015-2019 Summer 2015 Edition

<sup>2</sup> [www.gov.uk/government/publications/fixing-the-foundations-creating-a-more-prosperous-nation](http://www.gov.uk/government/publications/fixing-the-foundations-creating-a-more-prosperous-nation)

## Infrastructure skills challenges

The **National Infrastructure Plan** sets out plans to improve, extend and upgrade our essential infrastructure assets. An updated infrastructure pipeline published July 2015 contains details of a £411 billion investment in 564 projects and programmes from 2015/16 onwards.<sup>3</sup> It shows increasing investment levels across our transport, energy, communications and environmental networks.

Across all sectors there is increasing competition for resources. This is already manifesting itself in skills shortages, driving increased costs and affordability pressures.

To deliver this investment means **bringing more workers into the infrastructure market**, through new apprentices, technicians and graduates and attracting skilled workers from other industries. It will mean **retraining and up-skilling the existing workforce** to deliver improved productivity and performance demanded by the changing profile of investment and modern methods of construction. And it will mean **improving the way the labour market operates**, stripping waste and bureaucracy to **improve mobility and efficiency** across sectors and regions.

Infrastructure UK's Cost Review programme continues to collaborate with industry to improve delivery, through **the Infrastructure Client Group**.<sup>4</sup> Skills plays a key role in this work.

Infrastructure UK's analysis of these challenges in the context of the infrastructure pipeline is set out below in Box 1.A.

### Box 1.A: Key findings from Infrastructure UK's analysis

With the growth in infrastructure investment, the pipeline creates a demand for over 250,000 construction and over 150,000 engineering construction workers by 2020, driving a need to **recruit and train nearly 100,000 additional workers** by the end of the decade.

The required skills blend to deliver the investment plans will change over time leading to a need to **retrain and up-skill around 250,000 of the existing workforce** over the next decade in addition to the need to recruit new workers.

A lack of detail on demand and supply – particularly within regions – coupled **with fragmented approaches to skills planning and high levels of bespoke training limit the effectiveness and efficiency of labour market mobility**. This makes it harder for skilled workers to move easily between sectors and projects, exacerbating key skills shortages for key projects and programmes.

Increasing investment levels will also lead to pinch points in capacity for **key elements of plant and materials** essential for infrastructure delivery. Whilst not the focus of this study, related analysis by Infrastructure UK indicates that for infrastructure projects the skills issue presents the most pressing challenge and is the more significant contributing factor to cost inflation. The government will continue to monitor the risk of potential plant and material capacity constraints on delivery.

The image of the construction sector also remains a barrier to attracting new entrants and encouraging greater diversity. These broader challenges are being addressed by government as

<sup>3</sup> [www.gov.uk/government/publications/national-infrastructure-pipeline-july-2015](http://www.gov.uk/government/publications/national-infrastructure-pipeline-july-2015)

<sup>4</sup> [www.gov.uk/government/collections/infrastructure-cost-review](http://www.gov.uk/government/collections/infrastructure-cost-review)

part of the wider work of government and industry in implementing the plans set out in the **Construction 2025 industrial strategy and** through a refocused Construction Leadership Council.

## **Improving infrastructure skills delivery**

The analysis and evidence presented in this report identifies a number of challenges across sectors, regions and skills groups that must be addressed to ensure the delivery of the infrastructure pipeline to 2020 and beyond.

The challenges faced can be grouped under five main themes.

- A. **Providing leadership and coordination**
- B. **Improving data on supply and demand**
- C. **Incentivising skills investment through procurement**
- D. **Improving mobility and up-skilling the existing workforce**
- E. **Encouraging young people and greater diversity**

### **A: Providing leadership and coordination**

The government has already provided leadership in setting out alongside Budget 2015 its plans for stimulating increased investment in sustainable skills development across all sectors.

However, construction and infrastructure delivery are characterised by a complex landscape of public and private clients and a highly fragmented supply chain. This structure has resulted in **poor integration of sector strategies and approaches to strategic skills planning and delivery**.

Transport investment represents over 30 per cent (£127 billion) of the overall pipeline and more than a third of the infrastructure pipeline in the next five years including delivery of Network Rail Control Period 5 and the first Roads Investment Strategy. As a major infrastructure skills employer, transport projects also represent a more significant short-term demand on skills and resources, with peak demand stretching across 2015 to 2020.

To address this challenge, government has appointed Terry Morgan CBE to develop a transport and infrastructure skills strategy, to help the transport industry ensure a continuous pipeline of skilled workers. Government has set out an ambition to create more than 30,000 apprenticeship places across the road and rail industry during the lifetime of this Parliament.

Energy and utility sector projects have a later peak skills demand from the end of the decade, with key subsectors, such as new nuclear generation reaching their peak demand in the early part of next decade. Projects in these sectors will often compete for the same skilled resources.

Opportunities to improve cooperation across projects and programmes to minimise peak demand should be explored across sectors, particularly energy and utilities.

### **B: Improving data on supply and demand**

Infrastructure investment certainty is a critical factor affecting employers' appetite and commitment to training and up-skilling its workforce across all regions of the UK.

Better visibility of investment pipelines provides national and regional infrastructure employers with the ability to plan and respond more effectively in partnership with training providers, industry leaders and sector bodies. Many local businesses and skilled workers are employed in other

construction sectors placing additional demands on scarce resources. Therefore, regional pipelines should consider skills demand from both economic infrastructure and social infrastructure works such as housing and construction of schools, hospitals and commercial developments.

The longer-term visibility of skills demand will help enable government and infrastructure clients to work with education and training providers to build the UK's capability, matched to the demands of the investment pipeline.

While many programmes and sectors already factor skills constraints and 'pinch points' into their investment planning, opportunities exist for public and private sector sponsors to make better use of pipelines to smooth investment demand within and across sectors, particularly where skills shortages are a significant driver of delivery risk. This could include consideration of areas where phased delivery across projects may provide opportunities for supply chain efficiency and investment, for example through optimisation of demand for specialist skills such as tunnelling across projects.

## **C: Incentivising skills investment through procurement**

The government has already **changed public procurement rules to incentivise skills training** to support sustainable employment. *Procurement Policy Note 14/15* set out a mandatory requirement on publicly funded projects. It requires procurers of major construction and infrastructure projects with a capital value over £10 million, and lasting 12 months or longer, to support skills development and the apprenticeship commitment.

Incentivising skills investment through procurement is already common practice on many major infrastructure projects, for example the Olympics and Crossrail, although approaches to incentivising skills investment on other major projects can be variable and are not always consistent with the delivery of sustainable employment opportunities.

## **D: Improving mobility and up-skilling the workforce**

To **improve visibility of demand** and **increase cross-sector and inter-project mobility**, employers should collaborate in more detailed demand management planning to identify opportunities for skills to develop and transfer between projects.

The analysis identified a wide range of skills passports and competency cards in use across infrastructure construction. Simplifying the current systems, with clear thresholds for transferable basic level qualifications to minimise need for duplicative retraining, would improve the mobility of skilled workers between sectors and projects. This is consistent with the government's objectives to deliver clear, high quality professional and technical routes to employment through simplifying and streamlining the number of qualifications.

Some of the immediate challenges to delivery could be addressed through more emphasis on initiatives to **up-skill and retrain the existing workforce** to adapt to the new skills and modern methods, such as off-site construction.

## **E: Encouraging young people and greater diversity**

Increasing levels of investment combined with attrition rates arising from an ageing workforce requires action to **attract more young entrants** to the construction and engineering construction industries.

A **different blend of skills** will be required to deliver the investment meaning more entrants with STEM related skills, especially in the rail sector and other engineering construction industries. For example, modern methods of construction including increased levels of offsite manufacture and widespread adoption of new digital technologies in the design, construction and delivery of the UK's infrastructure.

The government set out its plans alongside Budget 2015 to improve skills delivery and pathways across schools, further and higher education. This included:

- simplifying and streamlining the number of qualifications;
- improving destination data and careers advice;
- refocusing vocational provision to deliver the high-quality skills at intermediate and higher levels (level 3+) that employers need;
- abolishing employer NICs for apprentices under the age of 25; and
- increasing the quantity and quality of apprenticeships in England to 3 million starts this Parliament.

There are particular challenges in attracting young people and encouraging diversity in many areas of infrastructure and construction delivery. In July 2015 government announced a renewed Construction Leadership Council with a specific work stream looking at skills, led by Anna Stewart, Chief Executive Officer at Laing O'Rourke. This work stream will consider measures to improve the attractiveness of the industry to young people and steps that can improve diversity in the industry.



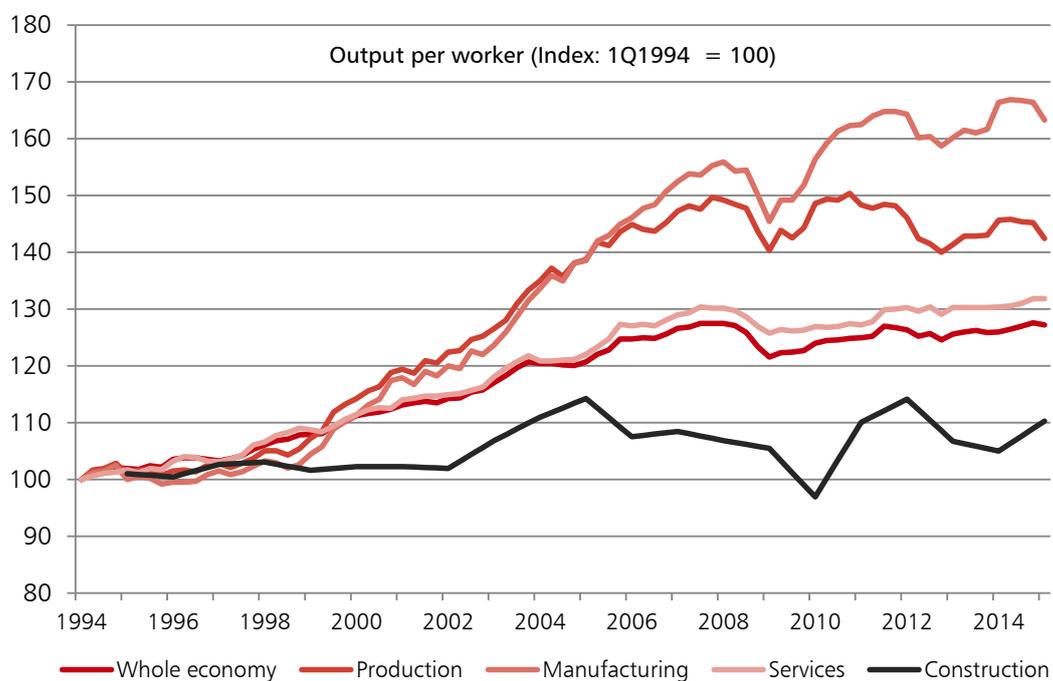
# 1 Skills context

**1.1** As the economy continues to return to growth construction demand is increasing, driving skills shortages and wage inflation across both traditional construction and infrastructure projects.

**1.2** The construction sector is vital to our economy, accounting for around £90 billion GVA per annum and employing 2.9 million workers directly. However, construction is a fragmented industry, with historically low levels of investment in skills and innovation.<sup>1</sup> It lacks diversity and is not always promoted as an attractive industry in which to pursue a career.

**1.3** Construction productivity growth has lagged behind the other sectors of the economy as shown in Chart 1.A. Addressing this productivity lag will improve infrastructure delivery and yield significant economic benefits. Ensuring we have the right skills in place is a key part of the solution.

**Chart 1.A: Productivity by increase in output relative to employment**



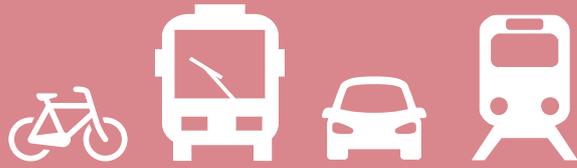
Source: Arcadis, ONS

**1.4** A failure to invest in the right skills will lead to constraints in capability and capacity in the supply chain, affecting productivity, delivery and driving inflationary pressures.

**1.5** Infrastructure projects and programmes already account for about 10 per cent of the total UK construction workforce and more than 50 per cent of the engineering construction workforce. Infrastructure output is forecast to grow to account for between 12 – 14 per cent of annual construction output by the end of the decade

<sup>1</sup> Department for Business Innovation and Skills: UK Construction: An economic analysis of the sector. July 2013

Chart 1.B: National infrastructure Plan pipeline – summer 2015



Transport

**£127.4 billion**



Energy

**£244.9 billion**



Communications

**£7 billion**



Flood defences

**£3.5 billion**



Water and sewerage

**£25.7 billion**



Waste

**£1.1 billion**



Science and research

**£1.4 billion**

**1.6** A construction industry survey<sup>2</sup> found that 97 per cent of respondents were concerned about a lack of skills and staff. There are already key recruitment hotspots for some professional skills in the highways and rail sectors, but there are challenges across all sectors. For example, some specialist occupational skills, particularly electrical engineering, essential for the power sector and rail electrification programmes, represent a short-term risk to delivery.

**1.7** The National Infrastructure Plan (NIP) pipeline, updated in July 2015, contains details of £411 billion of investment in 564 projects and programmes to 2020 and beyond. Chart 1.B sets out how this investment is split across sectors.

**1.8** To address the challenge of delivering record levels of investment, Infrastructure UK commissioned an infrastructure resource tool to model the employment, skills and potential training demand across the whole infrastructure pipeline<sup>3</sup>.

**1.9** The analysis and modelling had three strands:

- 1 **Demand side analysis** for infrastructure projects and programmes by applying labour modelling and forecasting tools to the NIP pipeline and projections of investment beyond current control periods in the regulated sectors.
- 2 **Supply side analysis** for infrastructure projects taking account of the economic context, competing major projects, and regional variations.
- 3 **Identification of key labour and skills gap challenges** to develop requirements for key skills, training and interventions.

**1.10** An industry-led steering group, chaired by the Chief Executive of the Construction Products Association, was established to oversee and share the outputs from this work and included representatives from government departments, major infrastructure clients, industry associations and skills bodies.

**1.11** This report describes the results of the resource modelling across sectors, regions and occupational groups and outlines the key challenges that need to be addressed to build the skills necessary to deliver our infrastructure plans.

**1.12** In response to these challenges and through current government actions on skills, Infrastructure UK will build on this initial analysis and continue to coordinate across stakeholders in the development of detailed action plans to deliver the required skills outcomes. Detailed actions and progress will be set out alongside further updates of the National Infrastructure Plan and in sector specific responses.

## Key current government action on skills

### STEM skills

**1.13** Increasing the pool of skilled labour over the long term will only occur if we get more young people with the STEM skills (Science, Technology, Engineering and Mathematics) that form the basis of a career in infrastructure construction. The government is introducing new, more rigorous GCSE and A-levels in Maths and Science, and will focus on increasing the take-up of STEM subject A-levels for girls in particular. Young people without good grades in Maths and English at GCSE will continue to study the subjects until the age of 18.

**1.14** Teaching quality is the most significant factor driving school outcomes, and the government will support England's teaching workforce to be world-class, including a review of

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<sup>2</sup>Construction News Barometer for Q3 2014

<sup>3</sup> The modelling and analysis was undertaken by the Construction Industry Training Board (CITB) and Whole Life Consulting Ltd (WLC)

the initial teacher training curriculum. In order to ensure that England has the highest STEM teaching quality, the government will train an additional 17,500 teachers in STEM subjects.

**1.15** The government will also improve the quality of schools in all areas of the country. More children than ever are now in a good or outstanding school. To build on this, the government will open a further 500 free schools during this Parliament.

### **University Technical Colleges (UTCs)**

**1.16** UTCs are an important part of our school reforms. They provide high quality technical education for those young people that choose to follow a more practically orientated education. They teach students technical and scientific subjects in a whole new way and are educating the engineers, scientists and technicians of tomorrow. The involvement of universities and employers provides more opportunities for young people than ever before.

**1.17** UTCs specialise in subjects where there is a shortage of skills. These include engineering, manufacturing, digital technologies and the built environment.

**1.18** Over 500 employers are involved in UTCs including major infrastructure names such as Network Rail and Siemens. UTCs also get significant input from world-class universities, with over 45 involved including Cambridge and Warwick. By working with a university and local employers, students benefit from access to:

- the latest research, industry experts and specialist facilities;
- real-life employer projects to stretch technical skills and creative thinking; and
- teaching and mentoring from specialists who currently work in industry.

**1.19** UTCs are meeting the needs of the skills gap and by 2017 more than 35,000 students will be able to follow this new technical education pathway.

### **National Colleges and Institutes of Technology**

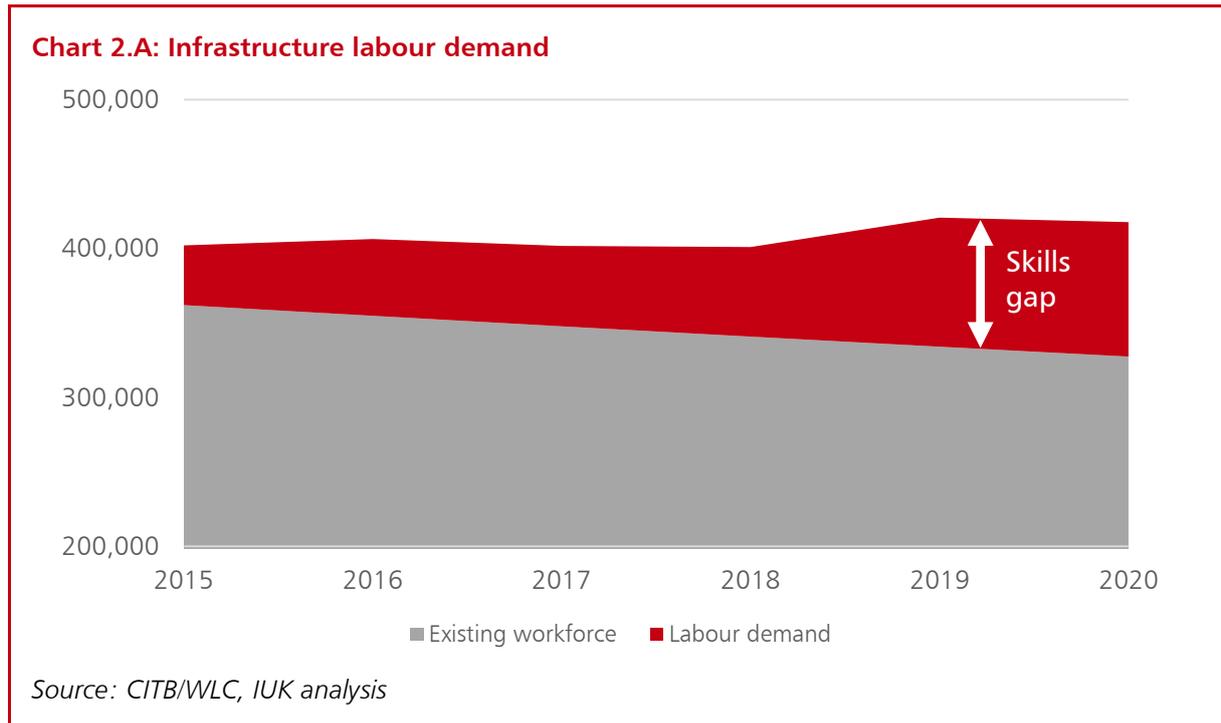
**1.20** Professional and technical education provision needs to be refocused to deliver the higher level skills that employers need. Strong institutions are needed to support this ambition. Employer-led National Colleges will provide high-level, sector-specific professional and technical education in key sectors. These institutions will enable bright young people to gain professional qualifications up to postgraduate level, and help the UK close productivity and skills gaps with its international competitors. The government will empower National Colleges to design professional and technical routes alongside employers, Catapults, elite professional institutions and professional bodies.

**1.21** Alongside National Colleges, the government will invite some local colleges to become prestigious Institutes of Technology to deliver high-standard provision at levels 3, 4 and 5. Building on international best practice, Institutes of Technology will be sponsored by employers, registered with professional bodies and aligned with apprenticeship standards.

# 2 Supply and demand forecasts

## Labour demand

2.1 The labour demand profile up to 2020 derived from the analysis and modelling is shown in Chart 2.A. This shows that at the start of 2015 the infrastructure pipeline generated a total workforce of around 380,000, increasing demand over the course of this year. The forecast increase in demand over the short term peaks at over 425,000 before the end of the decade.



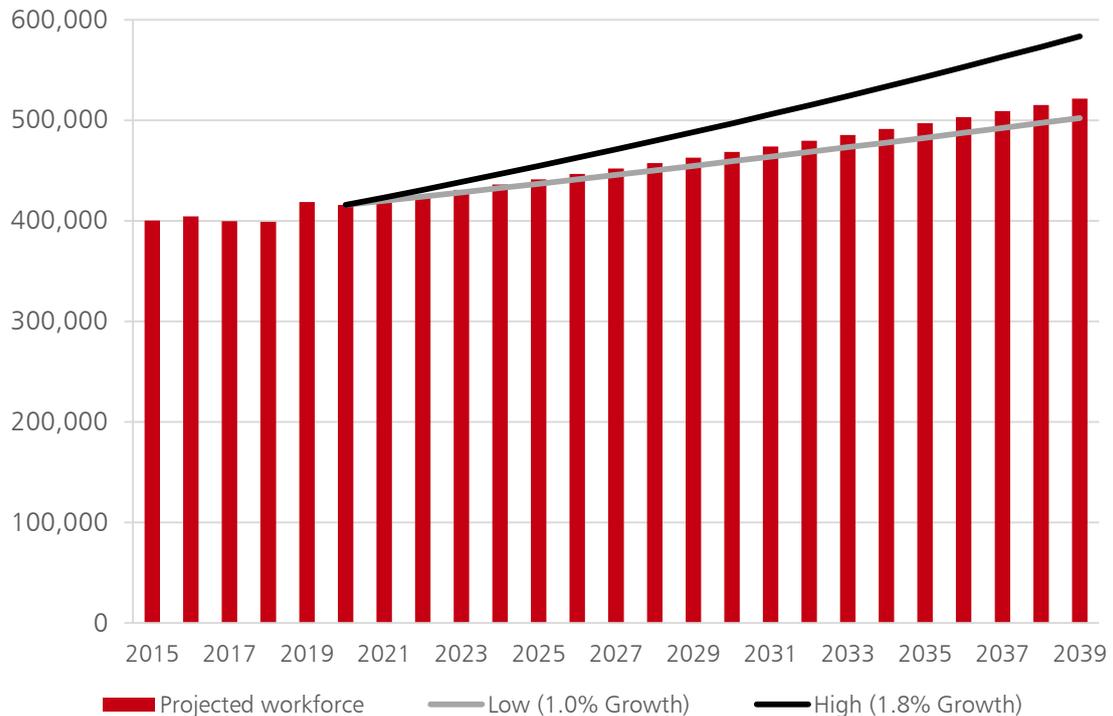
2.2 Chart 2.A also includes an estimate of the total available labour supply assuming an attrition rate of 2 per cent per year is applied to the current workforce. This shows that without any replacement, by 2020 there would be a reduction in workforce numbers meaning demand would outstrip supply by around 100,000 people. If not addressed, this would have a significant impact on the delivery of the infrastructure pipeline.

2.3 The analysis shows that there is a roughly equal split between the construction and engineering elements of the pipeline by value. The labour demand, however, is more heavily skewed towards the construction workforce due to its more labour-intensive characteristics.

## Long-term demand

2.4 While the detailed modelling and analysis of the skills required to deliver the pipeline investment has focused on the next five years, we have extended the projections for total demand to 2040 using both the longer term projects in the pipeline and forecasts of anticipated growth from Experian. The output presented in Chart 2.B shows demand for skills continuing to increase.

**Chart 2.B: Long term infrastructure skills**



Source: CITB, Experian, Infrastructure UK analysis

**2.5** Alongside the upward long-term demand trend, it is important to note that modern methods of construction – for example, through greater use of technology, standard products and components manufactured offsite in controlled factory environments – will require different skills (potentially located away from the traditional construction site) to deliver the same outcomes and outputs. Therefore, longer-term skills demand projections will need to consider the potentially disruptive change from a more efficient and productive delivery approach.

**2.6** As investment levels increase and demand for labour grows, it is also important to build an understanding of where potential constraints may exist in key elements of plant (e.g. haulage vehicles) and materials (e.g. bulk cement or aggregates for concrete). The Construction Products Association will develop a supply and demand gap analysis for key infrastructure plant and materials and present their findings in 2016.

### Skills and training levels

**2.7** Delivering the right skills to meet demand is about quality as well as quantity. The blend of skills and qualification levels needed is forecast to change over the short to medium term. For example, in the rail sector electrification and the move to in-cab signalling requires a different range of skills to traditional trackside infrastructure. While a proportion of these new skills will be met through new entrants to the sector, others will need to be delivered through retraining and up-skilling the existing workforce.

**2.8** The fragmentation of the industry compounds a lack of cross-sector planning of skills and training with many sector or project initiatives duplicating tasks and competing for similar skilled workers.

**2.9** In addition to addressing supply side measures, there are opportunities to smooth demand to prevent overheating current resources and increasing risks to productive delivery. Improving

the visibility of demand across sectors can help clients and industry plan a more effective and co-ordinated delivery response.

## **Labour supply**

**2.10** At the end of 2014 there was an estimated total workforce of 360,000 involved in delivery of current infrastructure programmes, with approximately 220,000 working in construction (traditional building and civil engineering construction skills) and 140,000 in engineering construction (the non-traditional construction workforce which includes elements of the work such as railway engineering and the engineering construction aspects of energy and utilities).

**2.11** Like any workforce, there will be flows as the existing people either change or leave employment, or new entrants start work. However in considering the future supply of workers to set against demand and conduct a gap analysis it has been assumed that:

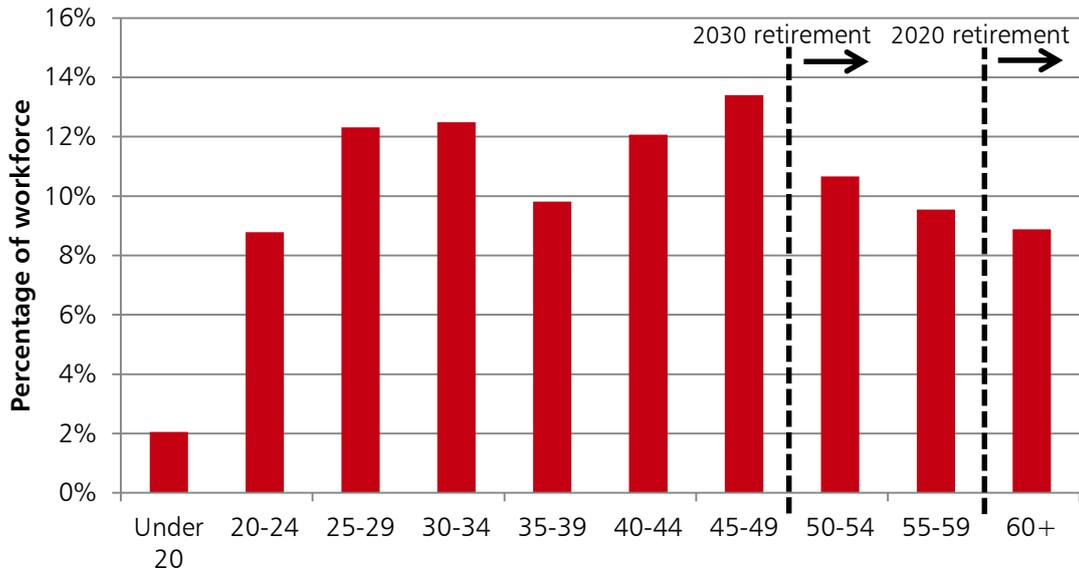
- people will leave the current workforce in a pattern that is similar to the current age distributions; and
- flows of workers out of the current workforce into employment in other industries will be cancelled out by flows of workers in from other industries (though this may not apply in some sectors where there is strong demand for similar skills from other sectors).

**2.12** Looking at the workforce in this manner gives a decay profile which would then be filled by new entrants into the UK workforce, either by young people entering from education or in the case of particular occupations identified by the Migration Advisory Council, workers from abroad with identified skills.

**2.13** The current age profiles of the construction and engineering construction workforces are set out in the Charts 2.C and 2.D. They show the proportion of the workforce under the age of 30 years is higher with the traditional construction workforce and the proportion of the engineering construction workforce over the age of 50 years is higher. This raises the risk of higher than average attrition levels in the sectors with higher proportion of highly skilled engineering construction workers – in particular the rail, power and utilities sectors.

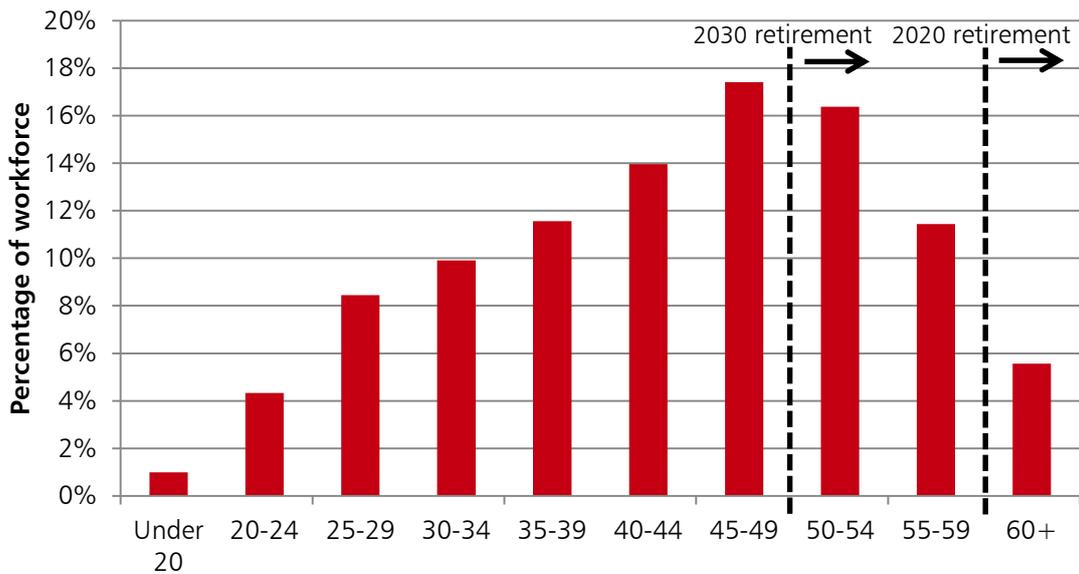
**2.14** In the short to medium term (from 2015 through to 2020), an attrition rate of around 2 per cent per year would result in an overall drop of 11 per cent in the total workforce. Projecting this to 2030 gives an overall workforce drop of 28 per cent compared to 2015.

**Chart 2.C: Working age profile – UK construction workforce**



Source: CITB

**Chart 2.D: Working age profile – EU skills workforce**



Source: CITB / EU Skills

# 3 Occupational groups

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**3.1** Delivering the planned infrastructure investment requires both construction (traditional building and civil engineering construction skills) and specialist engineering construction skills (the non-traditional construction workforce which includes elements of the work such as railway engineering and the engineering construction aspects of energy and utilities).

**3.2** For both, the workforce demands include client project leadership skills, design, project and site management skills, head office support as well as skilled trade and manual occupations.

## **Construction workforce**

**3.3** At the start of 2015, an estimated construction workforce of around 220,000 was delivering projects and programmes in the NIP pipeline. The pipeline drives a demand requirement across the range of all occupations involved in construction work.

**3.4** Research by CITB also shows that construction workers are able to apply their skills across different types of projects.<sup>1</sup> Therefore this degree of occupational mobility results in a workforce that is adaptable and potentially able to be drawn from a wider labour pool.

**3.5** However, within the range of construction occupations, there are some that are disproportionately in demand for infrastructure delivery, particularly in civil engineering professions and trades, construction supervisors, project managers and plant operatives.

**3.6** As a group these occupations represent 18 per cent of overall construction employment but account for over twice this level (37 per cent) of the current workforce supporting NIP projects and programmes. Civil engineering operatives and civil engineers will be particularly important with around a third of all civil engineering operatives involved in the pipeline and a quarter of all civil engineers.

### **Case study: Civil engineering skills**

Civil engineers are essential to the delivery of infrastructure projects, both at a national and local level, with even the smallest projects requiring a variety of civil engineering competencies from design and engineering feasibility to project management.

Civil engineers and the competencies they possess are in great demand across the UK economy, with their transferable skills vitally important to all economic infrastructure sectors. These skills are also utilised in other sectors, such as manufacturing and financial services. As multiple sectors return to growth the demand on engineering skills will continue to increase.

Over 20 per cent of civil engineers will retire in the next 15 years. While the number of students and graduates entering the profession is increasing, it is not occurring at a fast enough rate to fill the gap left by the retirees or to respond to increasing levels of demand.

**3.7** While age analysis of the current workforce indicates that by 2020, 9 per cent of the current workforce will be 65 years of age or over, increasing to 29 per cent by 2030, age analysis by main occupational groups highlights issues with two of the key identified occupational groups, namely plant operatives (mobile machine drivers and operatives) and construction trades supervisors.

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<sup>1</sup> CITB (2014) Workforce Mobility and Skills

**3.8** Both of these groups show a higher percentage of workers in the 55 years plus age group when compared to the overall sector profile. In the case of Plant Operatives approximately 28 per cent of workers are aged 55 plus compared to nearly 20 per cent for the sector in general.

### **Engineering construction workforce**

**3.9** At the start of 2015, an estimated engineering construction workforce of around 140,000 was delivering projects and programmes in the National Infrastructure Plan pipeline. However, unlike the construction workforce, the share of the workforce directly involved with these projects and programmes is higher and has a stronger influence on current workforce demand.

**3.10** In addition, the levels of attrition within some specialist skills and sectors are higher. For example in the power sector an estimated 50 per cent of current employees are set to leave the sector and 200,000 new recruits will be needed by 2023. In rail, 20 per cent of the workforce is over the age of 55 and 25 to 30 per cent of the traction, rolling-stock and electrification workforce will leave in the next five years.

**3.11** The challenges of meeting the demand for skilled workers are further affected by the need for new and different skills in the future as the type of works changes. For example, electrification of the railways and the move from track-side to in-cab signalling will demand different skills from the existing rail workforce.

### **Occupational groups**

**3.12** The analysis and modelling enables a more detailed view of the demand profile for key occupational groupings and skills types. Working with key skills bodies, clients and industry, a series of occupational groups for traditional construction and engineering construction were agreed and used for the analysis and modelling. The occupational groups allow a picture of demand across sectors for key skills and competencies to be presented and can be grouped to identify potential pinch points in capability and capacity.

**3.13** Many sectors, infrastructure clients and industry bodies already produce demand forecasts for their sectors, projects or disciplines. However, co-ordinating the output from such forecasts and drawing conclusions across sectors and regions is challenging due to the proliferation of and inconsistencies in job and skills descriptions used in different sectors.

**3.14** In considering these key skills, the occupations have been broken down into four occupational groups.

- **Client and project leadership** – incorporating client leadership and head office roles such as procurement. This category includes the project and commercial management roles from the supply chain.
- **Engineering and technical** – incorporating civil and structural, mechanical and electrical designers, architects and engineers, including specialist competencies such as BIM.
- **Construction management** – incorporating site supervisors, foremen, site engineering staff and construction managers.
- **Skilled trade and labour** – incorporating the site work force including key skills such as electricians, welders, carpenters, scaffolders, steel fixers, fitters, tunnellers, plant operatives and labourers.

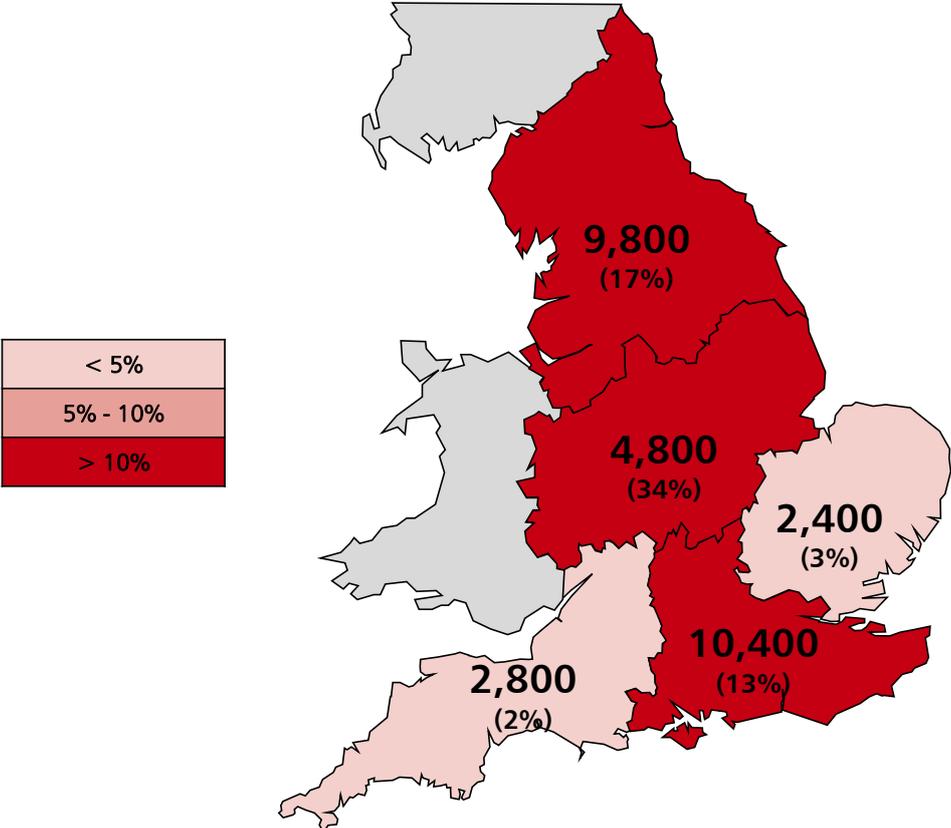
# Client and project leadership

3.15 Ensuring the right project leadership skills exist – in both clients and the supply chain – is essential to delivery. Many of these skills are required before construction begins, for example setting the detailed requirements, gaining consents and procurement. Such skills can be located in head offices away from the work face, or in project offices and on sites.

3.16 Many new project leaders have been recruited for major projects and programmes already in the development and pre-construction phases. For example, HS2 Ltd has begun recruiting their team and many supply chain companies have been forming their leadership teams to prepare for the works.

3.17 The analysis shows that demand will continue to increase across all the English regions in the short term. Even in the North where short-term increases in demand are lower, the large forward programme over the next decade including HS2 Phase 2 and other major transport schemes forming part of the Northern Powerhouse, means that planning for this demand now is essential to ensure the right skills will be in place.

**Chart 3.A: Client and project leadership skills peak to 2020 (% increase over 2015 supply)**



Source: CITB / WLC

### Case study: Major Projects Leadership Academy

The Major Projects Leadership Academy (MPLA) was established in 2012 to transform the implementation of government policy through world-class delivery of major projects by:

- returning major project leadership capability to Whitehall;
- developing project leaders to become world-class at successfully delivering major projects;
- creating a cadre of world-class project leaders, formed into an expert support network;
- elevating the status of project leadership professionalism in central government; and
- developing Permanent Secretaries' ability to foster a corporate environment that supports successful major project delivery and improve the way in which their organisations optimise use of the valuable project leader resource.

The government aims to have had all major project leaders enrolled in the academy's programme by 2015. In the future, no one will be able to lead a major government project without completing the academy programme.

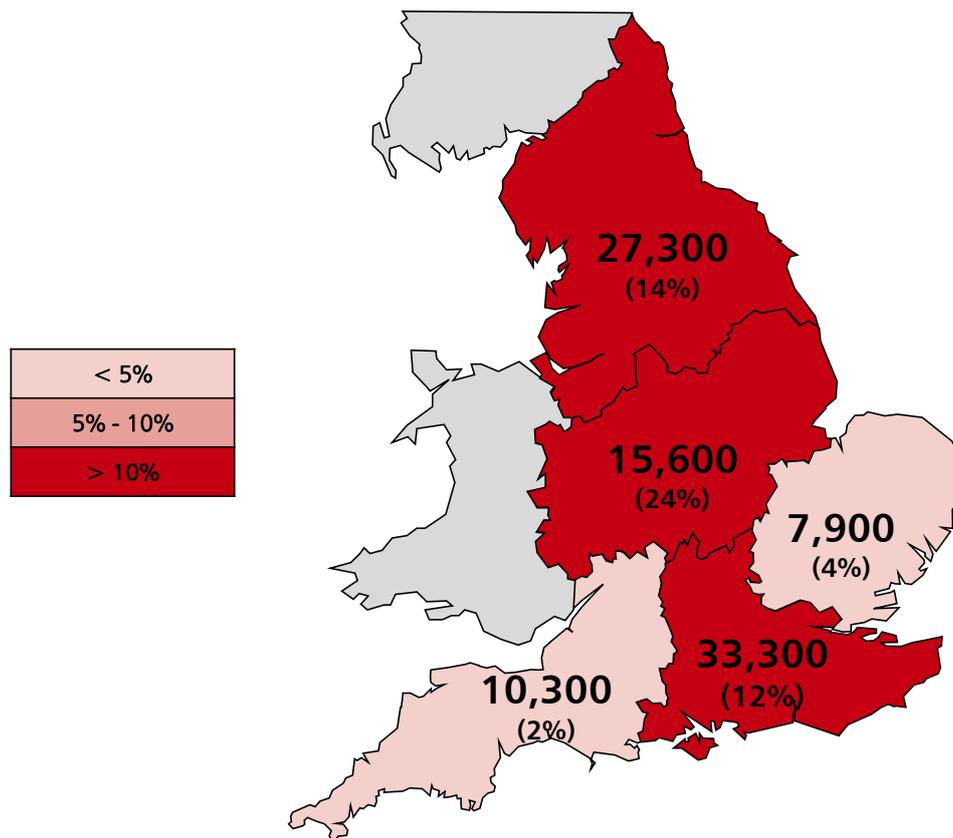
## Engineering and technical

**3.18** The essential technical and engineering skills required to support delivery are, like the project leadership roles, based both in office locations as well as project offices. Therefore, whilst Chart 3.B reflects demand for projects in specific regions, the location of the roles may in part be based elsewhere. Demand for many of these roles begins before construction as projects are in the design and development phases.

**3.19** The key skills include civil and structural engineers, mechanical and electrical engineers, as well as architects and key specialist roles within sectors. These skills are required throughout the project lifecycle with many critical to delivery as construction works progress.

**3.20** New technical skills, including digital and technology-based skills play an increasingly central role in delivery. For example, Building Information Modelling (BIM) is now deployed on the majority of infrastructure projects and uses advanced digital tools to manage and co-ordinate data, supporting more efficient design and delivery. Demand for these skills will continue to grow as new major projects such as High Speed 2 move into delivery.

**Chart 3.B: Engineering and technical skills peak to 2020 (% increase over 2015 supply)**



Source: CITB / WLC

### **Case study: Building Information Modelling – HS2**

HS2 is planning to implement BIM earlier and more pervasively than other projects. It supports government aspirations in delivering BIM Level 2, will be setting new standards and as a result transforming the use of data for infrastructure delivery. HS2 realises the value that BIM can bring and as a major infrastructure project will be an exemplar in its implementation, on an unprecedented scale digitising its entire asset lifecycle.

In the development of the hybrid bill and guided by BIM standards, methods and protocols all disciplines involved in engineering, environment, and land referencing produced coordinated, shared and managed information consistently within a common data environment provided by HS2. It has also enabled HS2 to ensure transparency by providing this data to the public via data.gov.uk.

Achieving the ambitious goals for BIM is only achievable through collaborating closely with the supply chain, industry, academia and schools. By clearly defining the organisational, asset and employer information requirements, providing access to the right educational materials, workshops and the National College for High Speed Rail and creating an environment which will last the life of the project and provide a digital legacy, HS2 will support its supply chain in realising BIM.

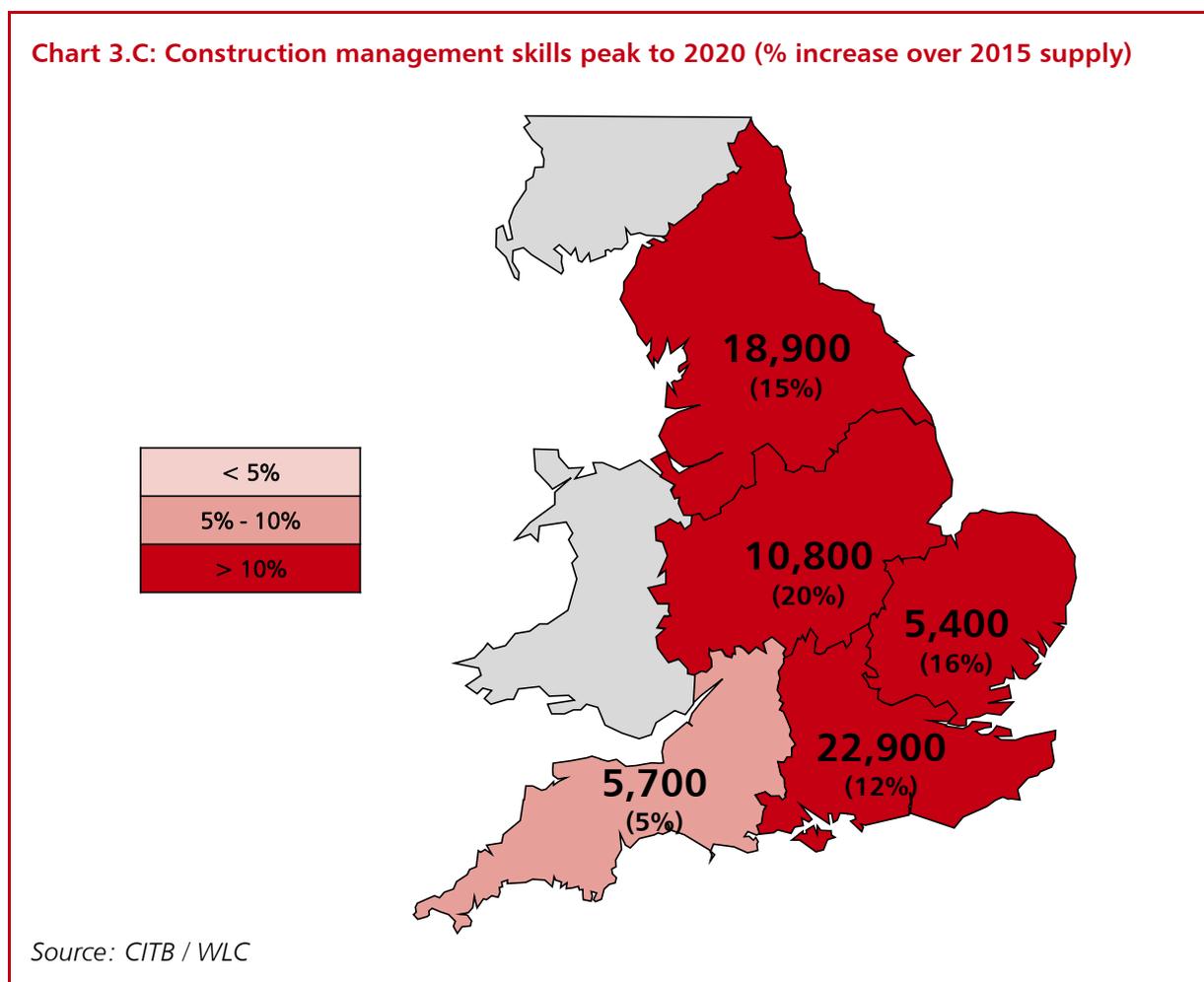
## Construction management

**3.21** Construction management and supervisory roles are focused at the delivery workforce and are an essential ingredient of productive and cost effective delivery.

**3.22** Historically many supervisors were skilled or professional people promoted and given a few training courses. Today supervision is a career in its own right, with opportunities for individuals to grow to higher levels of supervision and management, or to develop into other areas such as construction or project management.

**3.23** The construction management workforce includes many graduate professions, including civil engineers and other professions which play a central role. Their responsibilities include management of safety, quality and production as well as management of the skilled labour force.

**3.24** The heat map in Chart 3.C below indicates increasing levels of demand for these skills across all English regions over the next five years, with the midlands and east of England flagging the highest levels of demand against current supply.



### Case study: EngTechNow

It is estimated that by 2020 the UK will require 450,000 more science, engineering and technology technicians.

The Institution of Civil Engineers, Institution of Engineering and Technology and Institution of Mechanical Engineers collaborate to raise awareness of the value of registration as an Engineering Technician through initiatives such as EngTechNow which registers engineering technicians who have demonstrated the knowledge, skills and commitment to join the national register of professional engineers and technicians.

Professional recognition of technicians is also gathering pace amongst the engineering profession. In response, many employers are now actively reviewing business models and developing recruitment, retention and recognition policies.

## Skilled trade and site labour

**3.25** Demand for skilled trade and site labour is increasing, with peak demand outstripping supply in all regions of England over the next five years. The analysis indicates a number of key skills gaps that have the potential to impact delivery if not addressed across all sectors and regions.

**3.26** Within the range of construction occupations, there are some that are disproportionately in demand for infrastructure delivery, particularly in civil engineering professions and trades, construction supervisors, project managers and plant operatives.

**3.27** As a group these occupations represent 18 per cent of overall construction employment but account for over twice this level (37 per cent) of the current workforce supporting NIP projects and programmes. Civil engineering operatives and civil engineers will be particularly important with around a third of all civil engineering operatives involved in the pipeline and a quarter of all civil engineers.

**3.28** In addition to the need to increase the number of people, there are concurrent challenges with achieving a different profile of roles and capabilities to match the changing profile of roles required to deliver the future investment plans, particularly in engineering construction roles in the power, utilities and rail sectors. For example, electrification of the railways and the move from track-side to in-cab signalling will demand different skills from the existing rail workforce.

**3.29** In addition, the levels of attrition within some specialist skills and sectors are likely to be higher. For example in the power sector an estimated 50 per cent of current employees are set to leave the sector and 200,000 new recruits will be needed by 2023. In rail 20 per cent of the workforce is over the age of 55 and 25-30 per cent of the traction, rolling-stock and electrification workforce will leave in the next 5 years.

**3.30** In certain major projects and programmes, there is a need to recruit and re-train for a number of niche skills. For example, the works for Thames Tideway Tunnel will increase river traffic on the Thames as at least 4.2 million tonnes of excavated material could be transported by barges or ships. This is a 30 per cent increase to the existing river traffic and will require expert skills. There is currently a shortage of people working in river transport roles, especially non-traditional infrastructure roles such as boatmasters.

**3.31** In the nuclear sector, demand is projected to increase for a number of specialist skills. The case study below sets out measures to build capability for one such skill – high integrity welders.

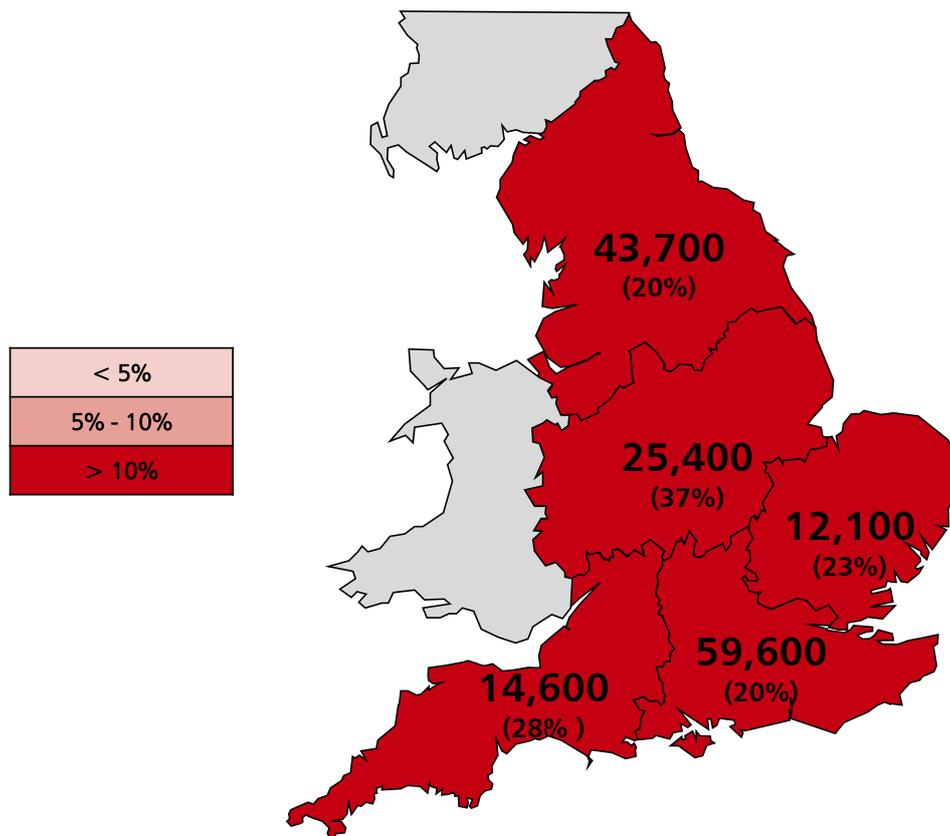
### Case study: High integrity welders

In 2013 an initiative was launched by the government and the Engineering Construction Industry Training Board (ECITB) to increase the essential skills training being undertaken by companies in the UK engineering construction sector. Under this initiative the government and ECITB pledged funds to help local employers fund additional apprentice training and up-skill existing workers.

Between 2013 and 2015, a total of £5 million of funding was provided by the government and the ECITB, enabling employers to initiate additional training programmes. The initiative has succeeded in attracting new entrants, such as school-leavers, into the engineering construction sector, as well as up-skilling existing workers. It will provide a stream of new essential skills for a range of UK industries – and particularly for the UK nuclear programme.

By March 2015, the initiative had made good progress in increasing the UK's engineering skills with more than 350 trainee engineers directly benefitting from the investment. Of these, approximately 100 individuals who joined the engineering construction welding programme were previously unemployed. The project also developed and secured approval for two new vocational qualifications in managing welding operations and high integrity manual arc welding, providing national recognition of these specialist skills.

Chart 3.D: Skilled trade and labour skills peak to 2020 (% increase over 2015 supply)



Source: CITB / WLC

# 4 Regional demand

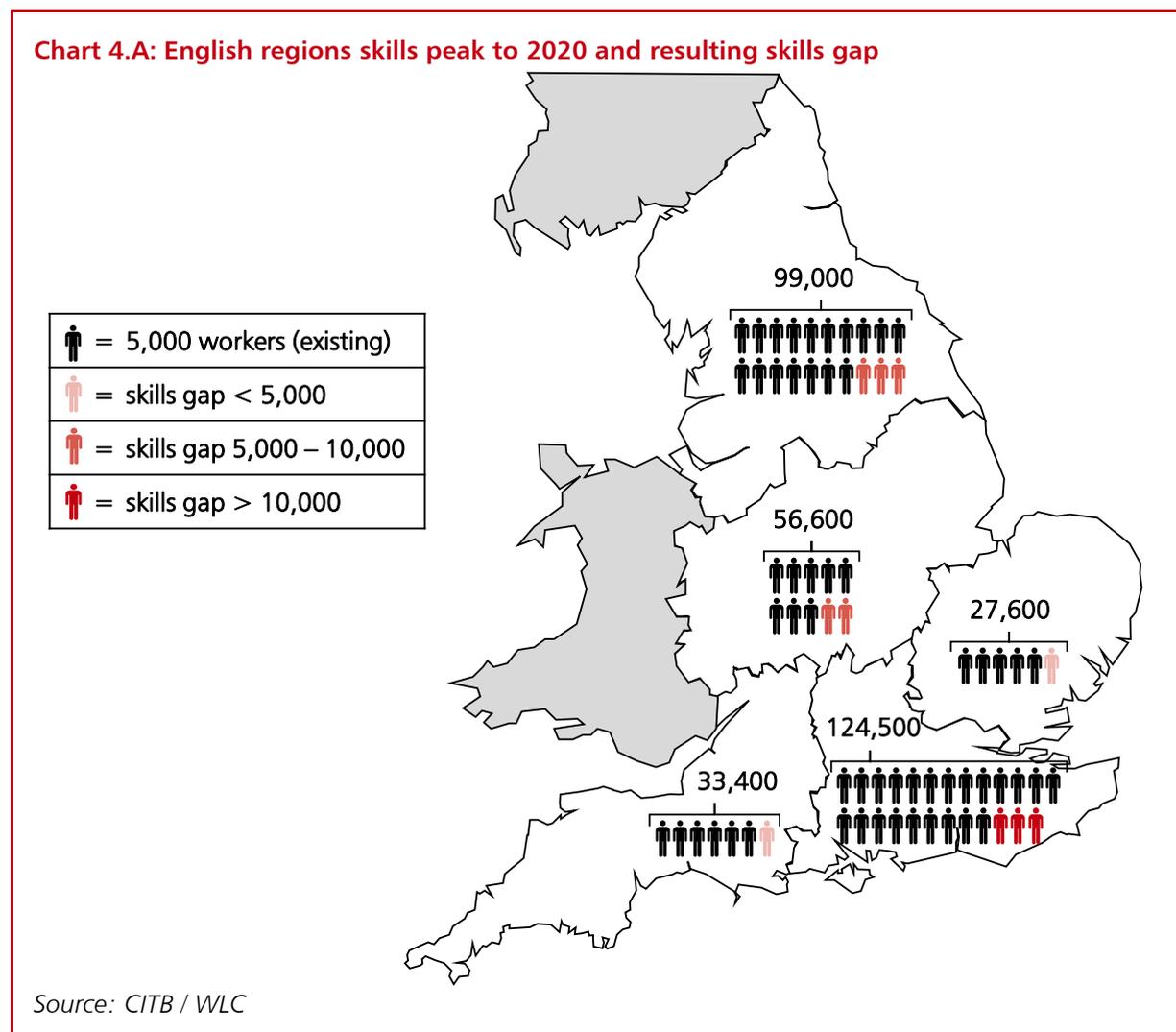
4.1 The NIP pipeline contains projects and programmes across the United Kingdom and impacts on skills demand across all regions.

4.2 Whilst within each region there are major projects and programmes being delivered by national contractors, there are also many regional and local businesses engaged in infrastructure works. In all cases, much of the skilled resources required for these projects and programmes is drawn from local labour within the regions.

4.3 Each region contains long term, local investment programmes, for example the regulated utilities such as water and electricity distribution. There are also a number of major projects within regions, for example Hinkley Point C in Somerset, that can bring disruptive change to local demand and supply which in turn could impact the delivery of other projects and programmes in the region.

## National picture

4.4 Demand is forecast to outstrip supply over the next five years in all English regions. Chart 4.A summarises the modelled skills gaps in each region.



## Key challenges

**4.5** There has been a historic lack of clear, regional pipelines across the UK meaning that clients and suppliers do not have a coherent, long-term picture of demand across regions. The lack of visibility and certainty of a forward pipeline has been cited by industry as a key barrier to investing in skills.

**4.6** In 2011 the government began publishing both the NIP pipeline – which contains infrastructure projects and programmes from public, private and regulated sector clients – and a separate pipeline of publicly funded construction projects, including schools, hospitals and social housing.

**4.7** Whilst this has helped to build an improved picture of demand across the UK and its regions, these pipelines do not represent total investment as they exclude private sector commercial, industrial and residential projects. However, some regions have now started to develop their own, more detailed investment pipelines.

**4.8** Publishing and sharing an aggregated pipeline with local businesses will help to build a more detailed understanding of the skills demands at a local level. This can then be matched with a clearer picture of supply capability in each region and the training provision needed to meet the skills challenges.

**4.9** For Northern Ireland, Scotland and Wales, the split between the responsibility of the UK government and each of the devolved administrations for infrastructure policy and funding varies according to the distinct devolution settlement in place for each administration. For example, responsibility for investment in roads infrastructure is fully devolved to the Northern Ireland Executive, Scottish government and Welsh government.

### Case study: North west construction pipeline

In March 2015, the Greater Manchester Chamber of Commerce released its latest construction pipeline analysis, covering for the first time the whole of the North West. The analysis aggregated projected demand across conventional construction, housing and infrastructure. Their report showed that:

- The planning system has a total of £114.4 billion of construction projects, with £69.8 billion expected to have a high degree of certainty of delivery.
- The output between 2015 and 2018 inclusive is expected to be £29.9 billion. The output is driven by infrastructure and housing at £10.9 billion and £6.8 billion respectively.
- Projects worth £40.4 billion are due to start in the four year period between 2015 and 2018 inclusive.
- Labour demand for 2015 is 184,000 workers, the average labour demand for 2015-2018 is 122,000 workers.
- The training needs for the 2015 – 2018 period are 45 per cent more than the average for 2011 – 2014.

## English regions

### Northern powerhouse

Current workforce	85,000
Skills peak	99,000
Skills gap	14,000 (16%)

**4.10** The government has set out its commitment to build a Northern Powerhouse, harnessing the potential of the core cities of the North of England. At the centre of this policy is £13 billion of government investment in transport across the North East, North West and Yorkshire and the Humber.<sup>1</sup>

**4.11** This strategy includes accelerated delivery of the HS2 Phase II Y-shaped network to Manchester and Leeds, a major uplift in rail capacity between Northern cities, as well as a commitment to deliver the improvements to the strategic roads network included in the current Road Investment Strategy.

**4.12** Taken together, these projects will provide a game-changing increase in infrastructure investment across the North. As such, there is the potential to reverse the historical flow under which engineers and operatives moved south to find work, due to the relatively low activity in the North.

**4.13** The timelines for much of this work create the opportunity to recruit the next generation of employees from the North, allowing them to develop careers building the Northern Powerhouse. However to achieve this it is important that there is a credible campaign to attract potential new entrants to the sector that focuses on the North's schools and colleges. It is also vital that there is the continuity of opportunities to ensure that a strong infrastructure delivery community can flourish across the North.

**4.14** For example, the NIP creates opportunities to stimulate growth in capacity in Yorkshire. While infrastructure output in the region has been constrained in recent years, the Road Investment Strategy contains plans for a series of major upgrades in the region.

**4.15** The North of England is also one of the key areas of the country where opportunities for shale gas are emerging. In 2014, the government announced the National College for Onshore Oil and Gas will be headquartered in Blackpool and linked to colleges in Chester, Redcar and Cleveland, Glasgow and Portsmouth. While activity in shale is currently limited to a small number of test sites, the Institute of Directors forecasts that up to 35,000 jobs could be created if the industry takes off. Many of these jobs would be local to the Bowland Basin, which stretches from Cheshire into Yorkshire.

### South West

Current workforce	29,800
Skills peak	33,400
Skills gap	3,600 (12%)

**4.16** The South West of England has historically been one of the regions of the UK with the lowest infrastructure construction activity. Its small population and low levels of industrial activity compared to other regions have depressed demand for significant investment.

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<sup>1</sup> [www.gov.uk/government/news/government-boost-for-northern-powerhouse](http://www.gov.uk/government/news/government-boost-for-northern-powerhouse)

**4.17** However the region now looks set to undergo a significant uplift in activity. Much of this is linked to plans to build a new nuclear power station at Hinkley Point in Somerset. That project alone will have a workforce at peak of some 5,600 individuals. While there is some existing capacity for experienced nuclear workers in the south west thanks to those involved in the operation and decommissioning of earlier units at Hinkley Point and nearby Oldbury and Berkeley, it is clear that there is a major task to ensure that there is a suitably experienced and qualified workforce for the project.

**4.18** Demand at Hinkley Point will be followed by a similar requirement for skilled workers to take part in the upgrade of the strategic roads network in the South West, including a planned £2 billion upgrade of the A303 to expressway standards alongside improvements to the A30 and A358.

**East of England**

Current workforce	24,300
Skills peak	27,600
Skills gap	3,300 (14%)

**4.19** Offshore wind looks set to play a significant role in the future of infrastructure investment in the East of England.

**4.20** Major wind farm projects including the £2 billion East Anglia One and the £1.5 billion Dudgeon are progressing, with offshore construction forecast to start for both schemes between 2016 and 2018.

**4.21** Many of those involved in the construction and later operation of these projects will be from the East of England. Yet, while there have been a number of smaller scale projects on the North Sea off the region’s coast, the demand for workers is likely to outstrip capacity. This is particularly the case for pinch point skills such as project managers, electrical engineers and welders.

**4.22** The region is looking forward to the £1.4 billion A14 Cambridge-Huntingdon upgrade. The Roads Investment Strategy also commits to the delivery of a series of improvements along the A47. This creates the potential to build significant new capacity for road construction in the region following completion of the A11 dualling project.

**4.23** Looking further to the future, plans continue to be developed to build a new nuclear power station at Sizewell in Suffolk. Should the project go ahead it would present a significant challenge as the high concentration of experienced engineers required to build the scheme would outstrip the available workforce in the region.

**The Midlands**

Current workforce	43,700
Skills peak	56,600
Skills gap	12,900 (30%)

**4.24** The delivery of HS2 looks set to act as a focal point for investment in infrastructure in the Midlands over the coming decade. With the project set to create around 26,000 jobs during construction of its first phase, this will provide significant opportunities for workers in the region.

**4.25** HS2 Ltd is seeking to harness this demand through the creation of a dedicated HS2 college in Birmingham. The college will focus on delivering the highly skilled specialist workforce that will be required to build HS2.

**4.26** One of the challenges for the Midlands may be how it holds on to its infrastructure workforce in the period prior to the start of works on HS2, giving competing pressures from other regions that may lead to a skills drain to other parts of the country.

**London and the South East**

Current workforce	108,800
Skills peak	124,500
Skills gap	15,700 (14%)

**4.27** London and the South East have historically been the strongest market in terms of infrastructure construction activity. The rapid growth in population in the capital has created a demand for heavy investment to provide capacity for London’s transport and utility infrastructure.

**4.28** It seems likely that this will remain the case into the future, with current major investments such as Crossrail and the Thameslink programme giving way to new projects including the upgrade of Bank underground station, Thames Tideway Tunnel, the Northern Line extension and HS2. Further major projects such as Crossrail 2 and new south east runway capacity are beginning to develop on the horizon.

**4.29** With limited space on the surface, much of London’s future pipeline of major projects requires works underground. For this reason there have been efforts in recent years to increase the supply of workers with tunnelling and underground construction experience.

**Case study: Skills and training on Crossrail**

Crossrail has now appointed 460 apprentices. Around two in five (44 per cent) Crossrail apprenticeships have been filled by people that were previously not in work, a figure that is double the UK average. They have been trained in a range of professions from construction to accountancy and quantity surveying to business administration.

Alongside these apprenticeships, 3,886 jobs have been created by contractors for local and/or previously unemployed people on the project. Over 12,000 people are currently working across 45 Crossrail construction sites.

The creation of the Tunnelling & Underground Construction Academy in Ilford demonstrates how Crossrail is supporting the development of key skills for the project. Since opening in 2012 it has had over 10,000 enrolments on its courses.

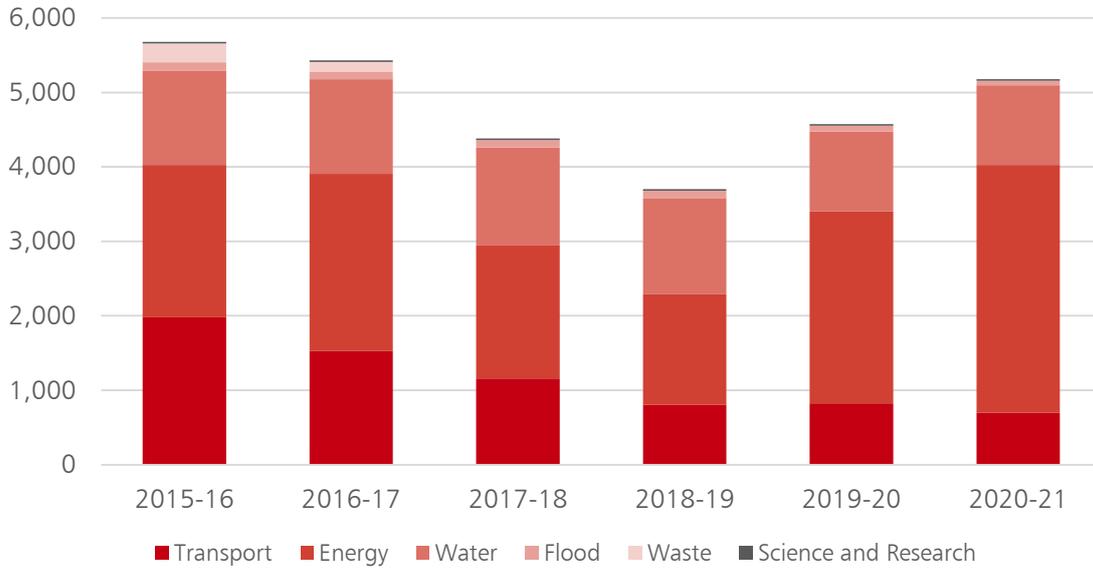
**4.30** With this track record of major investment, London has seen significant movement of workers from elsewhere in the UK to service this demand. With infrastructure output around the country expected to increase rapidly over the coming years, there is a risk that this supply of workers may not be as large as previously. This situation is exacerbated by the relatively high cost of living in London, which makes it difficult for some workers to afford to live in the capital.

**4.31** These findings are supported by a joint London Chamber of Commerce and Industry / KPMG report<sup>2</sup> published in 2014 which forecasted that the capital’s construction industry would need a workforce that was 20 per cent larger by 2017, with infrastructure acting as one of the major drivers of this increasing demand. It predicted that the delivery of projects in London will be in jeopardy unless steps were taken to increase the workforce to meet demand.

<sup>2</sup> Skills to Build – LCCI / KPMG Construction Skills Index (London and the South East) 2014

# Northern Powerhouse

## Infrastructure pipeline investment 2015-2020 (£29 billion)



(excluding regional share of national programmes)

### Key projects



#### Energy:

Moorside Nuclear Power Station, Trafford Power Station, Drax Biomass Conversion



#### Transport:

Mersey Gateway Bridge, Northern Hub, A1 Leeming to Barton



#### Science and research:

National Graphene Institute

### Skills demand 2015-2020

Current workforce: 85,000

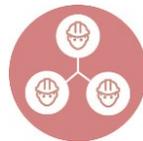
Peak workforce: 99,000



Client and project leadership



Engineering and technical



Construction management

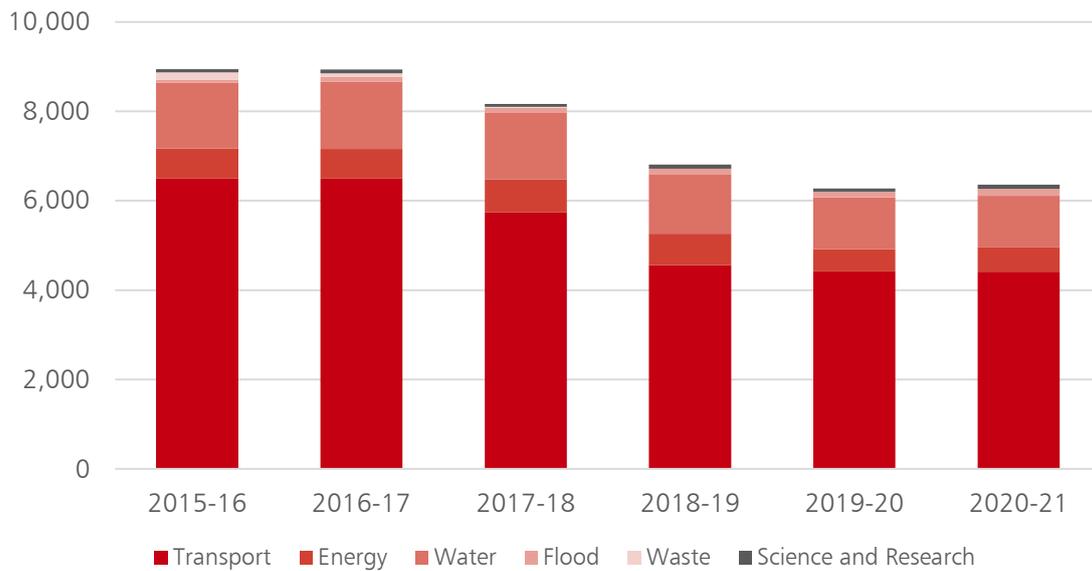


Skilled trade and labour

	Client and project leadership	Engineering and technical	Construction management	Skilled trade and labour
Current	8,300	24,000	16,400	36,300
Peak (year)	9,800 (2015)	27,300 (2015)	18,800 (2015)	43,700 (2020)

## London & South East

### Infrastructure pipeline investment 2015-2020 (£45 billion)



(excluding regional share of national programmes)

### Key projects



#### Flood:

Thames Estuary Programme, Oxford-Western Conveyance



#### Transport:

Crossrail, Thameslink, Northern Line Extension, Bank Station Upgrade



#### Water:

Thames Tideway Tunnel, Thames Water AMP 6 Programme

### Skills demand 2015-2020

Current workforce: 108,800

Peak workforce: 124,500



Client and project leadership

Current

9,200

Peak  
(year)

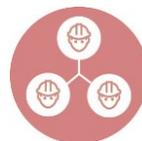
10,400  
(2016)



Engineering and technical

29,800

33,300  
(2016)



Construction management

20,400

22,900  
(2016)



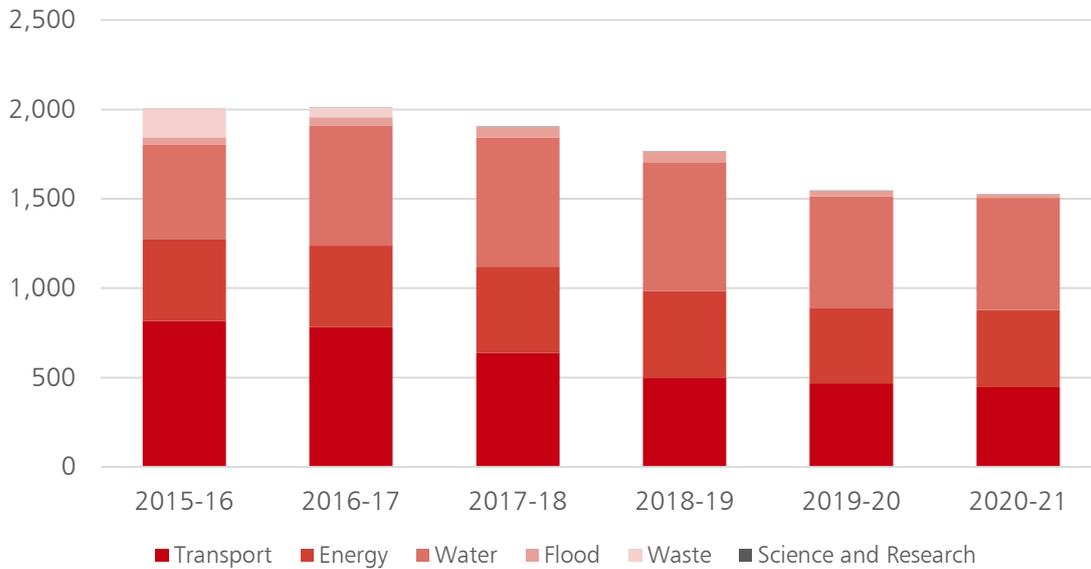
Skilled trade and labour

49,500

59,600  
(2019)

## Midlands

### Infrastructure pipeline investment 2015-2020 (£11 billion)



(excluding regional share of national programmes)

### Key projects



#### Energy:

EON Central Networks RIIO programme, BHEG Walsall ACT plant



#### Transport:

M1/M6 J19 Improvement Works



#### Water:

Severn Trent AMP 6 Programme

### Skills demand 2015-2020

Current workforce: 43,700

Peak workforce: 56,600



Client and project leadership



Engineering and technical



Construction management

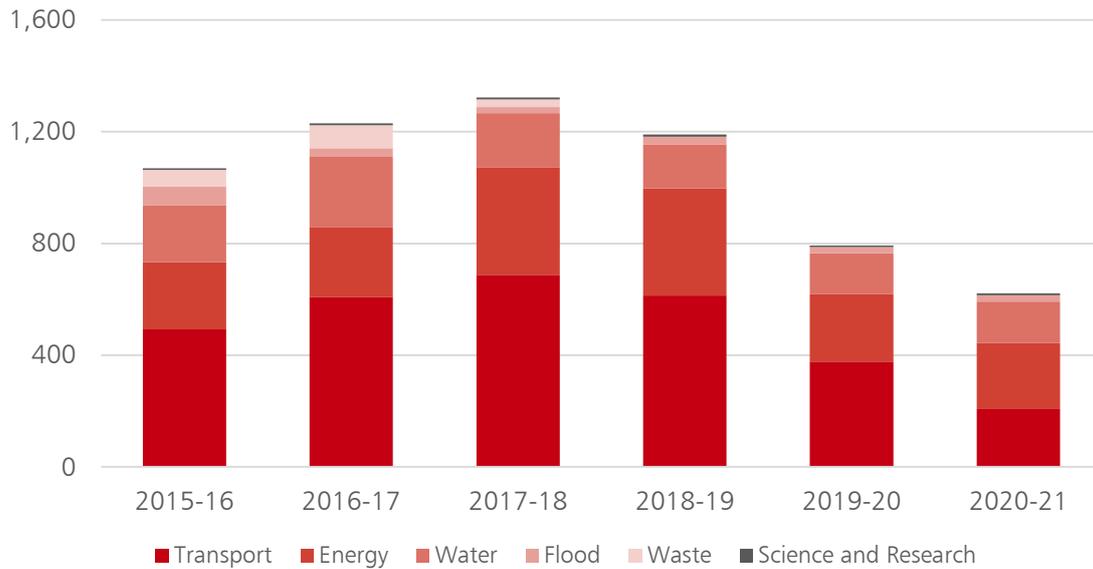


Skilled trade and labour

	Client and project leadership	Engineering and technical	Construction management	Skilled trade and labour
Current	3,600	12,500	9,000	18,600
Peak (year)	4,800 (2020)	15,500 (2020)	10,800 (2020)	25,400 (2020)

## East of England

### Infrastructure pipeline investment 2015-2020 (£6 billion)



(excluding regional share of national programmes)

### Key projects



#### Energy:

UKPN Eastern Power Network RIIO programme, Wren Power & Pulp CHP



#### Transport:

A14 Improvements, Croxley Rail Link, A5-M1 Link



#### Water:

Anglian Water AMP 6 Programme

### Skills demand 2015-2020

Current workforce: 24,300

Peak workforce: 27,600



Client and project leadership

Current

2,300

Peak

2,400

(year)

(2016)



Engineering and technical

7,600

7,900

(2016)



Construction management

4,600

5,400

(2017)



Skilled trade and labour

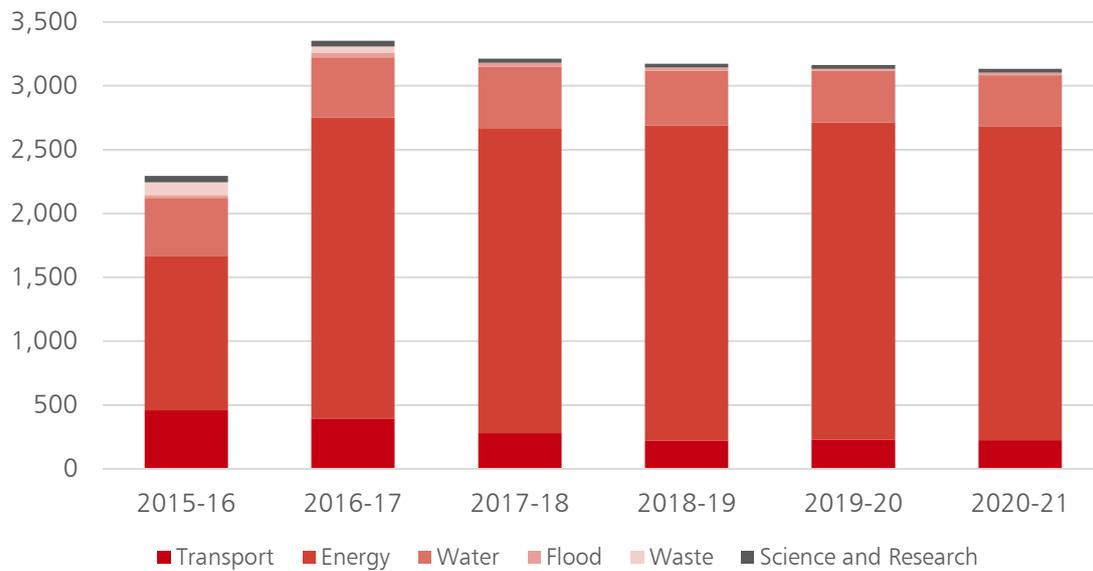
9,800

12,100

(2017)

## South West

### Infrastructure pipeline investment 2015-2020 (£18 billion)



(excluding regional share of national programmes)

### Key projects



#### Energy:

Hinkley Point C Nuclear Power, Western Power Distribution SW RIIO programme



#### Transport:

Bristol Temple Meads, Kingskerswell Bypass



#### Water:

South West Water AMP 6 Programme, Wessex Water AMP 6 Programme

### Skills demand 2015-2020

Current workforce: 29,800

Peak workforce: 33,400



Client and project leadership

Current

2,800

Peak (year)

2,800 (2015)



Engineering and technical

10,100

10,300 (2019)



Construction management

5,400

5,700 (2015)



Skilled trade and labour

11,400

14,600 (2019)

# 5 Sector analysis

## Transport

5.1 Transport is one of the largest sectors in the pipeline covering a broad range of projects across rail, roads, ports and airports.

### Transport investment and skills demand

5.2 Total projected expenditure in the transport sector from 2015/16 to 2020/21 is forecast at £107 billion, with the expenditure profile and split between sub-sectors set out in Table 5.A.

**Table 5.A: Projected transport expenditure (£m)**

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Roads	5,099	4,453	4,425	4,399	4,672	5,346
Rail	9,158	9,719	8,779	8,495	9,876	10,090
TfL	2,254	2,211	2,468	2,476	2,377	2,523
Ports / Airports	1,747	1,455	1,172	1,166	1,286	1,280

*Source: Infrastructure UK, Major Infrastructure Tracking Unit*

5.3 The infrastructure projects and programmes within the transport sector have a current labour demand of around 180,000 people with a blend of skills drawn from both construction and engineering construction disciplines.

5.4 Both increasing investment levels and a changing profile of skills to deliver these plans present challenges to clients and the supply chain. Peak labour demand is forecast to increase to over 216,000 by 2020 across all main occupation groups.

	 Client and project leadership	 Engineering and technical	 Construction management	 Skilled trade and labour
Current	11,000	43,200	41,600	80,900
Peak (year)	12,800 (2020)	52,600 (2020)	46,900 (2020)	103,700 (2020)

5.5 The Department for Transport recognises the skills challenges the sector faces in the years ahead. Together with its infrastructure delivery bodies and client organisations it directly or indirectly employs more than 60,000 people and with a supply chain extending to 150,000 people. It is accountable for the delivery of nearly one third by value of the NIP pipeline.

5.6 In August 2015, the government announced the appointment of Terry Morgan CBE to develop a transport and infrastructure skills strategy, to help the transport industry ensure a continuous pipeline of skilled workers. Government has set out an ambition to create more than 30,000 apprenticeship places across the road and rail industry during the lifetime of this Parliament.

## Rail

5.7 The rail workforce covers stations, electrification and plant, signalling and track and rolling stock manufacture. It includes the works associated with Network Rail's Control Period 5,

Transport for London’s tube upgrade programme, and the conclusion of the Crossrail works and the ramp up of construction activity for High Speed 2.

**Projected investment and skills demand**

**5.8** Total projected expenditure in the rail sector from 2015/16 to 2020/21 is forecast at £65 billion. The expenditure profile and split between main sub-sectors is set out in Table 5.B below.

**Table 5.B: Projected rail expenditure (£m)**

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Network Rail	6,274	6,070	6,087	5,244	6,141	6,141
TfL	1,530	1,498	1,629	1,542	1,330	1,509
Crossrail	2,083	2,015	1,122	250	169	18
High Speed 2	801	1,634	1,570	3,001	3,566	3,931

*Source: Infrastructure UK, Major Infrastructure Tracking Unit,*

**5.9** The workforce is split with just under two thirds working in the engineering construction sector, mainly railway engineering. The railway engineering workforce is around 70,000 with most working in permanent way at Levels 1-2. The construction workforce is below 40,000.

	 Client and project leadership	 Engineering and technical	 Construction management	 Skilled trade and labour
Current	6,700	24,100	30,600	50,000
Peak (year)	8,000 (2020)	29,200 (2020)	33,000 (2020)	65,300 (2020)

**Key features**

**5.10** The government has set out a £38 billion programme for enhancing and maintaining the current network with the delivery of Network Rail’s Control Period 5 works. This activity will be supplemented as the rail systems work for Crossrail is followed by the major activity associated with High Speed rail.

**5.11** This programme creates potential skills pinch points, particularly the engineering skills requirements for rail systems, with anticipated shortfalls in capacity for signalling and telecommunications. These findings are supported by the National Skills Academy for Railway Engineering who in 2013 forecast a shortfall of 1,600 to 2,000 signalling/telecoms workers over the following five years.<sup>1</sup>

**5.12** Electrification also creates a potential shortfall in electrification and plant engineers. The same research anticipated a need for 1,000 new employees joining the sector to work on electrification and plant by 2019.

**5.13** In addition to shortages for skilled engineering construction workers, the railway industry faces challenges recruiting experienced managers in both project and commercial teams. New demand, as HS2 Ltd builds its team, has amplified this situation. While there will be some restocking as those working on Crossrail are gradually released into the wider industry, there is likely to be continuing upward pressure on demand for these skills in the foreseeable future.

<sup>1</sup> [www.nsare.org/news-room/latest-news/nsare-launches-skills-forecasting-report.aspx](http://www.nsare.org/news-room/latest-news/nsare-launches-skills-forecasting-report.aspx)

**5.14** With the support of two rail industry leadership bodies, the Rail Supply Group and the Rail Delivery Group, the National Skills Academy for Railway Engineering is developing a specific skills strategy for the rail industry. Due for publication in 2016, the strategy will identify the actions needed to recruit, retain and up-skill rail workers.

#### **Case study: National Training Academy for Rail (NTAR)**

NTAR will tackle the future skills shortage in the traction and rolling stock segments of the UK rail sector. When the academy opens in October 2015, it will offer 20,000 man days of training per year and act as a national 'hub' with regional 'spokes' located at other train care facilities around the country.

The bespoke state-of-the-art facility, which is located in Northampton, will combine the use of unique hands-on equipment and workshop facilities in addition to classroom-based teaching using cutting edge technology. It was established in response to a forecast skills shortage of around 4,000 people over the next five years, caused by factors such as an ageing workforce, the technological advancement of rolling stock, and investment and growth in the industry.

NTAR will also offer leadership master classes and other training in support of traction and rolling stock initiatives such as European Train Control System (ETCS) design, installation and maintenance, and all aspects of the digital railway of the future.

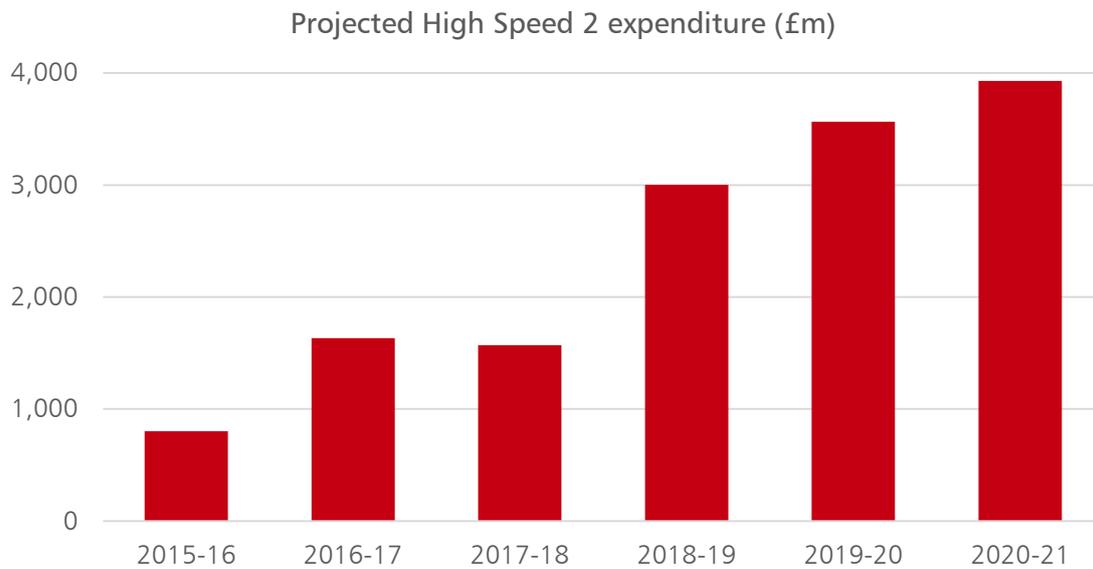
Key elements include:

- a large, fully-fitted workshop;
- state-of-the-art virtual reality suite;
- An European Rail Traffic Management System / ETCS room;
- a digital railway room; and
- an area dedicated to railway electrification.

An agreement between the National Skills Academy for Railway Engineering and the Department for Business, Innovation & Skills with support from the Department for Transport has provided half the funds required to build NTAR, with Siemens contributing the other 50 per cent. The 50/50 funding agreement will release 50 per cent of the academy's training capacity to the wider UK industry, with the remainder used by Siemens' own rail sector employees.

## Transport – High speed rail

### Infrastructure pipeline investment 2015-2020 (£15 billion)



### Skills demand 2015-2020

Current workforce: 2,150

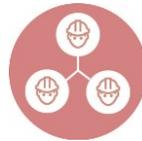
Peak workforce: 30,100



Client and project leadership



Engineering and technical



Construction management



Skilled trade and labour

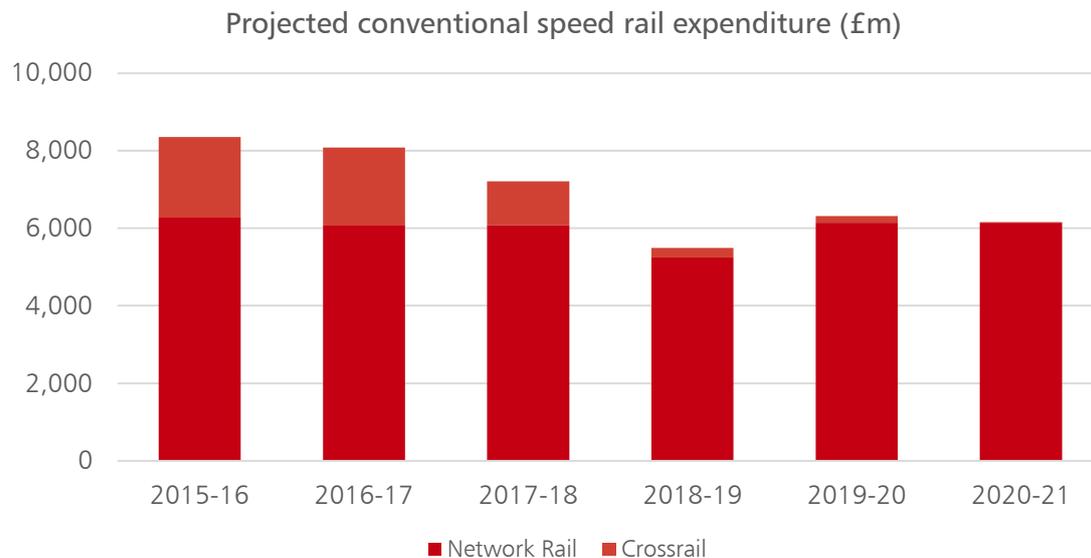
	Client and project leadership	Engineering and technical	Construction management	Skilled trade and labour
Current	900	1,000	250	0
Peak (year)	2,000 (2020)	8,200 (2020)	3,900 (2020)	15,900 (2020)

### Key skills challenges

- Large ramp up in resources, with immediate demand in client, project leadership and technical roles required to prepare the project for construction
- Competition for resources with other parts of the rail sector at a time of increasing investment levels
- New technology and delivery approaches, including the use of Building Information Modelling (BIM), demanding non-traditional rail delivery skills
- Creating opportunities for local companies and disadvantaged and under-represented local people to benefit from the investment in HS2
- Building a supply chain capable of meeting the long term demand for up to 50,000 concurrent jobs in the late 2020s

## Transport – Conventional rail

### Infrastructure pipeline investment 2015-2020 (£42 billion)



### Skills demand 2015-2020

Current workforce: 94,700

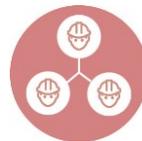
Peak workforce: 98,700



Client and project leadership



Engineering and technical



Construction management



Skilled trade and labour

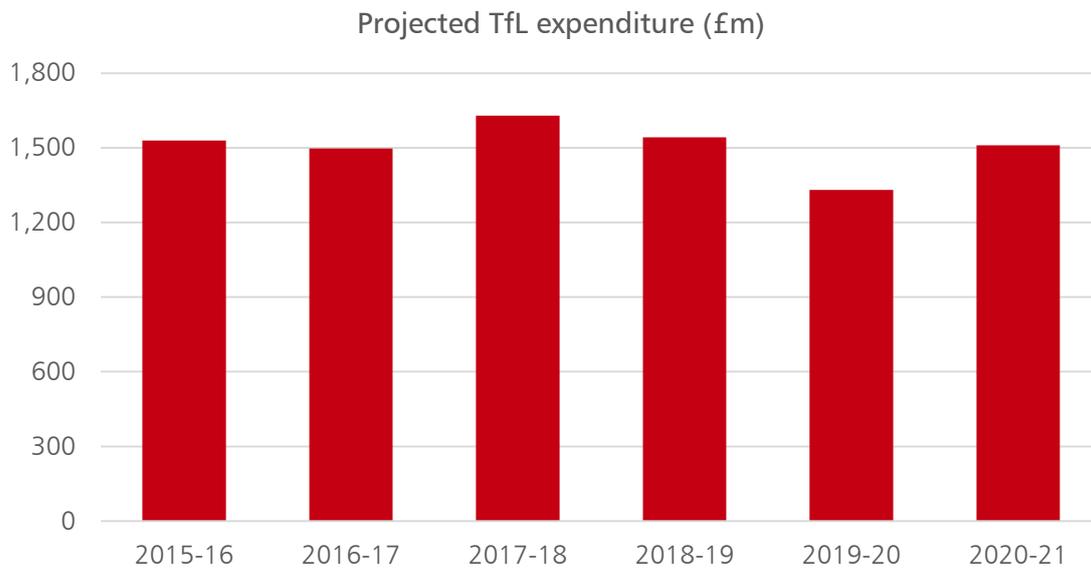
	Client and project leadership	Engineering and technical	Construction management	Skilled trade and labour
Current	5,700	21,000	27,300	40,700
Peak (year)	6,000 (2015)	21,900 (2015)	28,000 (2015)	42,900 (2016)

### Key skills challenges

- Delivering the long-term investment programme with a large proportion of critical skills approaching retirement age
- Ensuring skills built on Crossrail delivery are not lost to the industry
- Helping the supply chain to adapt to develop the skills and products to deliver the changing blend of works in the future programme
- Improving the ability of workers to move across sub-sectors and projects without the need for bespoke training

## Transport – Transport for London

### Infrastructure pipeline investment 2015-2020 (£9 billion)



### Skills demand 2015-2020

Current workforce: 16,600

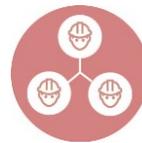
Peak workforce: 25,200



Client and project leadership



Engineering and technical



Construction management



Skilled trade and labour

	Client and project leadership	Engineering and technical	Construction management	Skilled trade and labour
Current	1,000	3,100	3,300	9,200
Peak (year)	1,500 (2020)	4,900 (2020)	4,800 (2020)	14,000 (2020)

### Key skills challenges

- Delivering the long-term investment programme with a large proportion of critical skills approaching retirement age
- Ensuring skills built on Crossrail delivery are not lost to the industry
- Creating opportunities for local companies and disadvantaged and under-represented local people to benefit from the investment in London's transport network
- Improving the ability of workers to move across sub-sectors and projects without the need for bespoke training

## Roads

**5.15** The roads sector includes major capital and renewals projects across both the Highways England investment portfolio and local schemes.

### Projected investment and skills demand

**5.16** Total projected expenditure in roads from 2015/16 to 2020/21 is forecast at £30 billion with investment rising to nearly £6 billion per annum by the end of the decade, equating to a workforce of over 60,000 people.

**5.17** Although most of the workforce has historically drawn on traditional construction skills, with the introduction of new technologies including Smart Motorways there is a trend toward a broader range engineering and technical skills required to deliver the future investment plans.

### Key features

**5.18** With a trebling of the investment in roads to £3 billion a year by 2021 and investment of £15.2 billion in over 100 major schemes over the 2015/16 to 2020/21 Road Period, this will place a considerable burden on plant, labour and materials nationally and regionally. This increased investment in roads renewal and maintenance is to be delivered over the same period as other infrastructure projects with their own competing resourcing requirements.

**5.19** The recent and forecast growth in activity in the UK roads sector contrasts with lower levels of output in the earlier part of the decade.

**5.20** The slowdown in the UK's economy between 2010 and 2012 saw a 41 per cent decline in workload, with an estimated 10,000 employees leaving the sector. Those who left the UK's roads sector included large numbers of experienced senior staff, leading to a sharp reduction in the UK's capacity to manage highways projects and maintenance. While most of this reduction occurred in the supply chain, there has also been a slimming down of employment by the major customers in the roads sector in recent years. Now, with a rapid increase in forecast investment in the UK, the principal challenge for the sector is to restore this capacity of experienced designers, project managers and commercial staff.

**5.21** This has been accompanied by a shift in the work carried out. Traditional approaches to tackling congestion involving heavy civil engineering have given way to a more mixed approach, making better use of the existing assets through intelligent use of technology such as the introduction of Smart Motorways. This has led to a change in skills requirements for customers and suppliers, requiring all to understand how to integrate technology into more traditional construction activities. There is also a requirement for those involved in projects to be able to deliver in line with government policy requirements related to the use of Level 2 Building Information Modelling by 2016.

**5.22** While the UK construction sector faces challenges in terms of attracting new entrants, the issue is particularly acute for roads. A perception of an often unfavourable working environment near live traffic, and the requirement for much work to be carried out at times when the road network is least busy make it difficult to make a positive case for careers in the sector. This is compounded by a lack of clear guidance on entry routes for those that decide to join the industry.

**5.23** With more than 200 highways authorities in the UK, there is a wide range of capabilities and competences among the current workforce. The Highways Term Maintenance Association is working to identify and standardise qualifications and competencies for maintenance activities, to help raise standards and achieve more consistency.

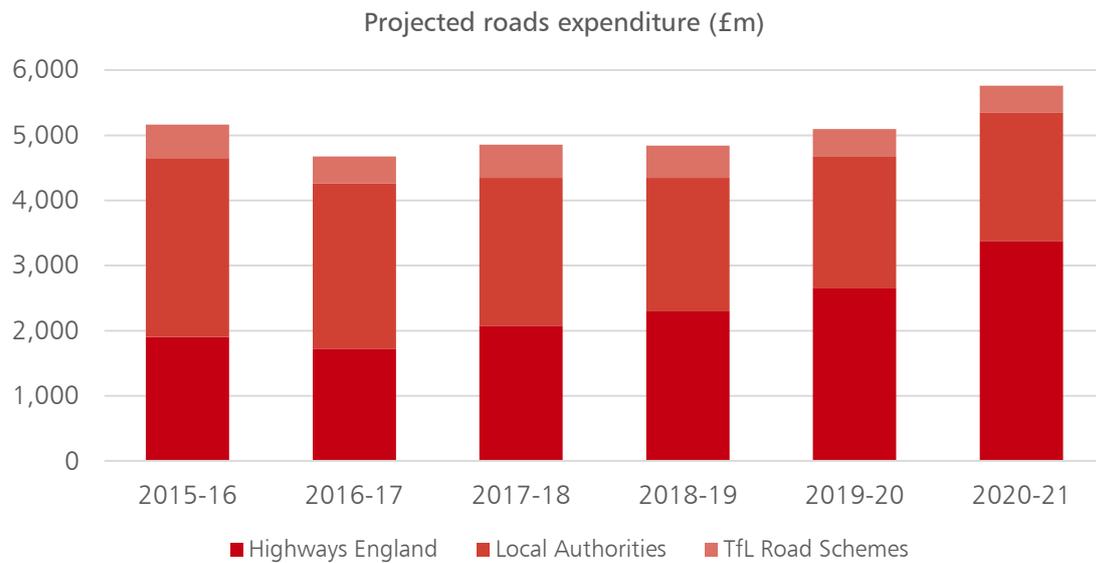
**5.24** The vast majority of contracts let by Highways England (HE) will be through the Collaborative Delivery Framework (CDF) (currently up to £5 billion of major projects) or standard Asset Support Contract (covering smaller projects). Both place a requirement on the supplier to create at least one apprenticeship place per £20 million spend.

**5.25** There is an option within the CDF for individual schemes to become Skills Academies in their own right. This obligation on the supplier has already been included within the current A14 Cambridge to Huntingdon tender. In addition, through an earlier framework, Smart Motorway delivery partners are committed to establishing a training academy on all new managed motorway schemes.

**5.26** HE announced in its March 2015 Delivery Plan that it would publish a Supply Chain Strategy, highlighting how it intends to drive a step change in relationships and growth in capacity and capability. The Delivery Plan also announced an industry review of skills and capability by December 2015 and following this review HE will publish its skills and capability development plan in March 2016.

## Transport – Roads

### Infrastructure pipeline investment 2015-2020 (£30 billion)



### Skills demand 2015-2020

Current workforce: 47,000

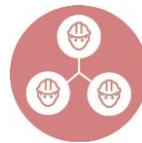
Peak workforce: 62,000



Client and project leadership



Engineering and technical



Construction management



Skilled trade and labour

Current	2,700	14,000	8,700	21,600
Peak (year)	3,500 (2020)	18,500 (2020)	11,500 (2020)	28,600 (2020)

### Key skills challenges

- Increasing investment levels stretching capacity and capability in the supply chain
- Shortages of haulage vehicles and drivers, with long lead times having the potential to impact delivery
- Demand for new types of skills as technology plays an increasing role in delivery solutions
- Competition for resources, particularly amongst clients, project leaders and design and technical roles
- Perceptions of attractiveness of industry to new recruits

## Energy

5.27 Energy, one of the largest sectors within the infrastructure pipeline, includes investment in new electricity generation plant, nuclear decommissioning and oil and gas capital investment.

### Projected investment and skills demand

5.28 Total projected expenditure in the energy sector from 2015/16 to 2020/21 is forecast at £104 billion. The expenditure profile and split between main sub-sectors is set out in Table 5.C (for the skills analysis, expenditure on gas and electricity transmission and distribution is included within Utilities sector).

**Table 5.C: Projected energy expenditure (£m)**

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Generation	7,002	8,332	8,919	11,145	11,811	13,535
Oil & Gas	10,372	7,926	6,164	5,479	4,403	4,403
Nuclear Decomm.	681	749	765	707	758	815

*Source: Infrastructure UK, Major Infrastructure Tracking Unit*

5.29 The sharp fall in oil prices at the end of 2014 has reduced projected expenditure in the latter half of the decade. This reduction is offset by projected increases levels of investment in electricity generation projects, with significant expenditure on offshore wind and new nuclear projects expected towards the end of the decade.

5.30 Demand for labour peaks at around 106,000 people towards the end of the decade. Within subsectors there are significant skills challenges towards the end of the decade caused by the ramp up of new nuclear and offshore wind programmes, at the same time as the reduction in forecast investment in offshore oil and gas.

	 Client and project leadership	 Engineering and technical	 Construction management	 Skilled trade and labour
Current	13,000	30,300	15,200	39,900
Peak (year)	13,000 (2015)	30,300 (2015)	15,200 (2015)	48,300 (2019)

## Electricity generation

5.31 The electricity generation programme contains investment in conventional gas power stations, new nuclear power and renewable power schemes such as offshore wind.

### Projected investment and skills demand

5.32 Expenditure on energy generation projects shows an increasing spend towards the end of the decade, rising to around £13 billion per annum. Total projected expenditure from 2015/16 to 2020/21 is forecast at £61 billion which result in the demand for skilled workers to rise by around 50 per cent to approximately 79,400 by the end of the decade.

### Key features

5.33 As one of the key expected growth markets in UK infrastructure over the coming years, the electricity generation sector faces considerable challenges in terms of its skills requirements.

**5.34** The planned increase in new nuclear capacity is forecast to increase the labour demand in this sub-sector from an almost standing start to around 19,000 by about 2023. The most notable pinch point will arise with the planned delivery of major new nuclear power stations at Hinkley Point in Somerset, Wylfa Newydd on the Isle of Anglesey and Moorside in Cumbria.

**5.35** Based on current expectations, the workforce for nuclear projects is expected to peak at in the early part of next decade, requiring a significant inflow of new workers to the sector. This will include 3,500 professional and 3,000 technical employees that will need to be placed. Each site will also require a total of around 4,000 civil engineering workers, representing up to 50 per cent of the total civil engineering population of Wales, and 25 per cent in the South West.

**5.36** Specific pinch points identified by the Nuclear Energy Skills Alliance include high integrity welders, control and instrumentation skills, project and programme management, steel fixers, concreters, civil engineering operatives and scaffolders.

**5.37** However, the long gap in nuclear construction in the UK, combined with the shrinkage of the workforce because of the age profile, means that the levels of net recruitment required to meet the growth of demand will be higher than the headline or gross figure. There will be a need to attract and train new employees at both the technical and graduate levels in very significant numbers.

**5.38** As well as training new people, one of the major requirements of the programme will be to attract and retain experienced personnel who are several years into their careers; this will mean attracting individuals who have gained experience in other sectors and enabling them to make the transition into nuclear.

**5.39** There are significant potential benefits therefore from cooperation across the nuclear programmes, considering the three current projects in development as a 'national programme' rather than discrete projects.

**5.40** Such an approach may also help address one of the key recruitment challenges in both the nuclear and the broader power and energy sector projects – the multiplicity of projects with different skills specifications makes it difficult for skilled workers to move from project to project and even from site to site. Where practicable, the industry would benefit from common standards and accreditation as long as this does not create an additional layer of qualification or barriers to movement.

**5.41** As a result of effective cooperation between industry, skills organisations and government, the programme requirements are well understood and measures are in place to address skills and productivity challenges. In view of the scale of the challenge and to address potential risks to project delivery, targeted action will be needed by industry in partnership with government to tackle skills pinch points.

### Case study: The Energy & Efficiency Industrial Partnership

The 67 employers behind the Energy & Efficiency Industrial Partnership (EEIP) have committed to co-invest with government to deliver a £115.5 million change programme to transform the skills system for the sector. Programme managed by EU Skills, the Partnership is a long term collaboration that will ensure an innovative and yet streamlined approach to recruitment and skills for the energy and utility sector.

Employer leadership is provided through a Council of CEOs from across the Partnership who provide strategic direction. Through EU Skills, the EEIP will deliver:

- an efficient and effective approach to managing and maximising the talent pool for the sector, whilst providing optimum outcomes for employers and individuals;
- high quality, flexible training and development programmes via different pathways, such as apprenticeships, traineeships, graduate programmes and transition routes from skilled roles in other sectors; and
- mechanisms to retrain and up-skill the current workforce to take advantage of new opportunities across the sector.

The Partnership serves as a 'laboratory' within which employers can test, refine and demonstrate new approaches to training development, delivery and assessment that will yield the skills the sector needs.

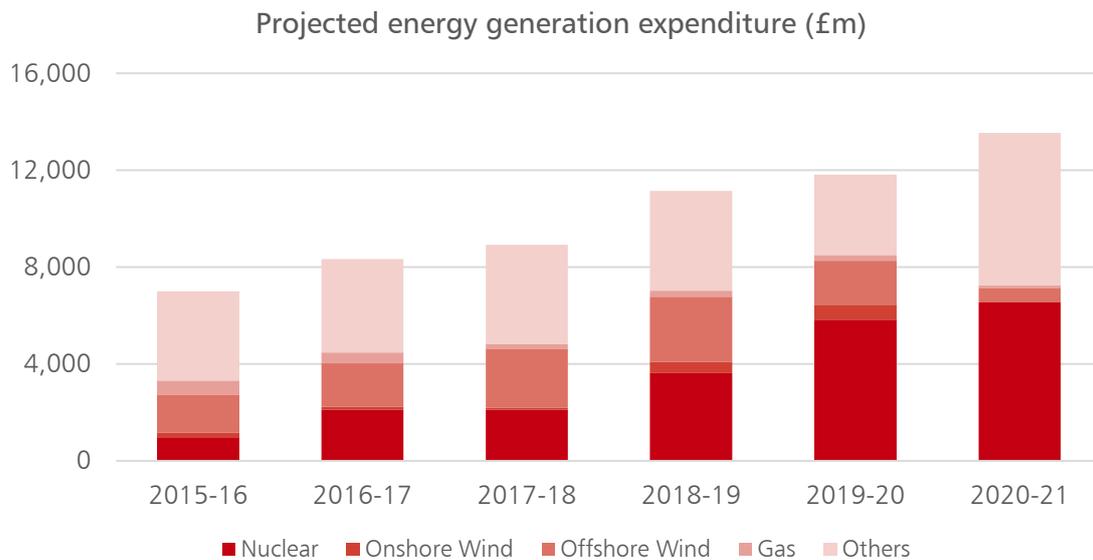
It has set itself the three year goal of achieving at least **3,500 new apprenticeships, 6,800 traineeships and youth employment programmes and 3,000 up-skilling and re-skilling programmes.**

**5.42** Outside nuclear power, the other major growth area for energy generation in recent years has been renewables. Offshore wind shows a sharp increase in the workforce by 2020. This is forecast to rise from about 5,000 to over 16,000 in 2018 due to the profiling of investment at the latter part of the decade.

**5.43** A renewable energy workforce of 18,500 in 2013 could rise to as much as 70,000 in 2023 according to sector trade body Renewables UK, depending on the blend of new generation projects. Such roles tend to be towards the higher end of the skills spectrum, meaning that the sector will face competition for resources from other parts of the infrastructure sector when it comes to attracting skilled and experienced workers.

## Energy – Electricity generation

### Infrastructure pipeline investment 2015-2020 (£61 billion)



### Skills demand 2015-2020

Current workforce: 48,100

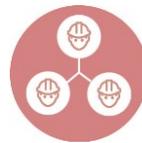
Peak workforce: 79,400



Client and project leadership



Engineering and technical



Construction management



Skilled trade and labour

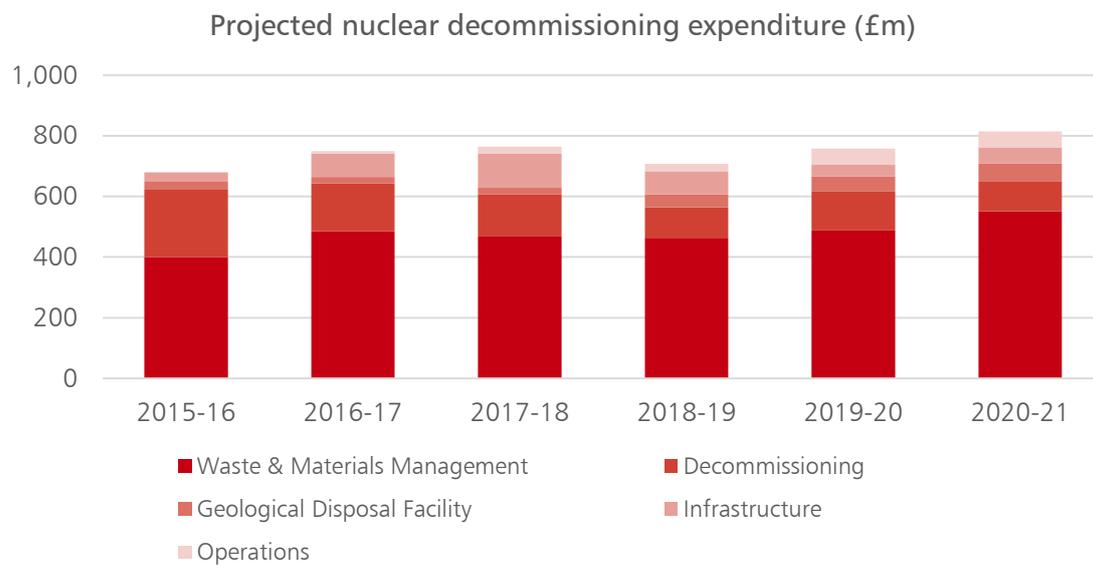
	Client and project leadership	Engineering and technical	Construction management	Skilled trade and labour
Current	6,000	17,000	6,700	17,800
Peak (year)	8,800 (2019)	23,500 (2019)	10,600 (2019)	36,400 (2019)

### Key skills challenges

- Ramp up in demand in new nuclear towards end of decade, with competition between projects for critical skills
- Potential shortages of key nuclear sector skills, including high integrity welders and commissioning resources
- Demand profile for offshore wind skills increasing significantly in latter part of decade as projects in development move to construction
- Challenge to utilise skilled workers from oil and gas industry into new roles in electricity generation

## Energy – Nuclear decommissioning

### Infrastructure pipeline investment 2015-2020 (£4.5 billion)



### Skills demand 2015-2020

Current workforce: 9,300

Peak workforce: 15,500



Client and project leadership



Engineering and technical



Construction management



Skilled trade and labour

Current	1,300	2,400	1,600	4,100
Peak (year)	1,900 (2020)	3,700 (2020)	2,400 (2020)	7,600 (2020)

### Key skills challenges

- Labour demand for nuclear decommissioning programme with shows an increase by about 50 per cent by 2022
- Competition for similar skills with new nuclear programme and other high integrity industries
- Current age profile of the industry requires strategies to bring new skills and workers into the industry
- Geographical mobility of labour employed at current decommissioning sites

## Utilities

**5.44** The utilities sector includes works for the transmission and distribution of gas and electricity, works for the regulated water sector, telecoms investment and energy efficiency through the smart meters programme.

### Projected investment and skills demand

**5.45** Total projected expenditure in the utilities sector from 2015/16 to 2020/21 is forecast at £101 billion.

**5.46** Through the current regulatory period, the water sector shows a workforce on average of around 55,000 with a peak in 2018 of about 65,000. The vast majority of the workforce are within the construction sector with just under 10,000 people in the engineering construction sector. Water projects include the Thames Tideway Tunnel which accounts for between 10-15 per cent of the water spend in the period.

**5.47** Ongoing investment programmes in telecoms and the distribution and transmission of gas and electricity networks make up the bulk of residual demand, with programmes across the whole of the UK.

### Key features

**5.48** Recent research from the Energy & Efficiency Industrial Partnership supports our analysis. It predicts that the utilities sector will need to attract around 208,000 new workers including 40,000 new technical staff in the next decade as it seeks to replace those who will retire from the industry. Around 50 per cent of the workforce are due to leave or retire by 2023.

**5.49** This situation is exacerbating existing pinch points for skills include overhead line operatives, welders, high pressure pipe jointers and controls engineering. Half of all employers in the sector already report that they are finding it hard to recruit for certain roles, leading to wage inflation and pressure to recruit workers from overseas.

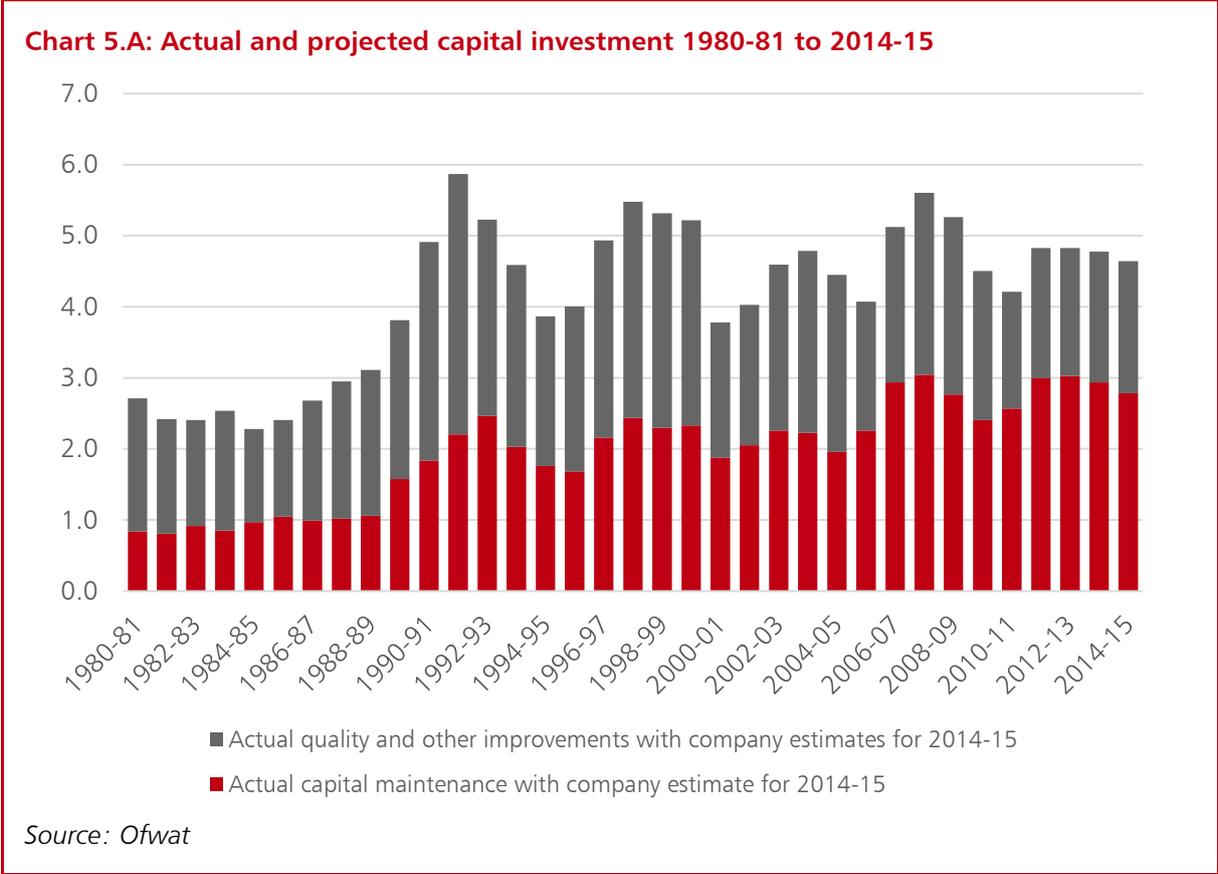
**5.50** As well as these specific roles, there is a general shortage of supply for professional staff. The foundation of this issue arises from the shortage of students undertaking STEM subjects, and the relative low attractiveness of the utilities sector for those that do choose to go down the STEM route.

**5.51** Peaks and troughs of workload intensify skills issues in the utilities sector. For those working on high voltage projects, the cyclical nature of work during the year means that operatives can be very busy for part of the year, while having to seek alternative work at other times. In the water sector the cycles are linked to the five year regulatory periods. Historically work has tended to peak in the middle three years of the cycle before falling off in the final year of one period and the first of the next. Sector trade body British Water suggests that this leads to the loss of up to 40,000 jobs during the 'trough' years, leading to a loss of continuity of employment with skills being lost to the sector.

**5.52** In July 2012 Infrastructure UK published the conclusions of a joint study with Ofwat and the water industry. The report (Smoothing Investment Cycles in the Water Industry) set out a series of recommendations to address the impacts of cyclical nature.

**5.53** The cross-industry group set up following publication of the report achieved a key milestone in 2013 when Ofwat gave water companies the chance to include so-called 'transition investment' in their business plans for the period from 2015 to 2020. This allowed companies to bring forward spending on these works into 2014. Water companies are financing the cost of accelerating these works, recognising the efficiencies that will arise as a result of doing so.

**5.54** The water companies business plans submitted in December 2013 identified transition investment of up to £440 million. The impacts of this approach to the AMP6 programme are shown in the Chart 5.A.



**5.55** The transition towards smart metering and a smart electricity grid will require a trained workforce to install and manage new equipment. With most homes expected to have smart meters by 2020, the National Skills Academy for Power anticipates a need for 6,000 new installers by 2017 to meet the demand for this programme.

### **Case study: Smart meter installation**

With smart meters now being installed in homes across Great Britain, Energy & Utility Skills estimate that there will be a requirement for the current workforce of around 2,000 to more than treble during peak roll out towards the end of the decade. This is to ensure that 53 million meters can be installed in every home and small business by 2020.

The bulk of the workforce required will be installers of electricity and gas smart meters – with an estimated peak demand of over 7,000 – with a requirement for Level 2 skills. However there will also be a demand for technician, supervisory and managerial skills at Level 3+ to support the programme of work.

Most of the installers will be employed by large energy suppliers or by meter operator providers (MOPs). Suppliers will either use their own workforce, and/or contract with MOPs to achieve their roll-out plans.

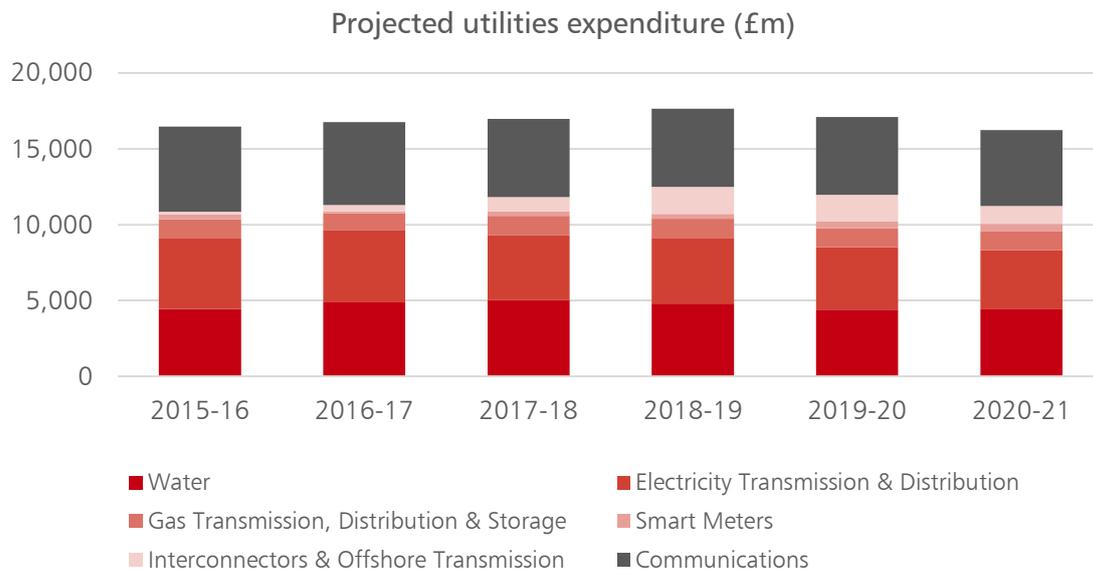
Although the installation programme will be able to draw upon the existing workforce, with appropriate re-skilling, the increase in the installation indicated cannot be met by this alone. New workers will be required the industry faces the challenge of ensuring sufficient numbers and spread of installers across all regions to meet the additional demand. This should provide opportunities for those looking to enter the market and support the industry led roll-out.

**5.56** DECC will continue to engage with the sector through the Smart Meter Implementation Programme to gain assurance that energy suppliers have a plan to secure or have access to sufficient resources to complete the smart meter roll-out by 2020. Progress will be captured in DECC's annual smart metering roll out publication.

**5.57** Other nascent technologies such as micro-generation, fuel cells and other forms of low cost energy storage have the potential to have a disruptive impact on the electricity transmission and distribution sectors. The potential impact on skills requirements will need to be considered in developing long-term strategies for skills demand.

## Utilities

### Infrastructure pipeline investment 2015-2020 (£101 billion)



### Skills demand 2015-2020

Current workforce: 85,000

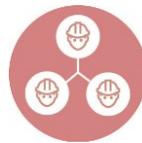
Peak workforce: 110,500



Client and project leadership



Engineering and technical



Construction management



Skilled trade and labour

Current	10,400	30,000	12,300	32,400
Peak (year)	12,500 (2018)	37,100 (2018)	16,000 (2018)	44,900 (2018)

### Key skills challenges

- Delivering the long-term, increasing investment programme with a large proportion of skilled workers approaching retirement age
- Helping the supply chain to adapt to develop the skills and products to deliver the changing blend of works in the future programme
- Increasing demand to retrain and up-skill the workforce to meet new delivery approaches
- Improving the ability of workers to move across sub-sectors and projects without the need for bespoke training

## Flood defences

**5.58** The flood defence sector includes works to reduce the risks of flooding and coastal erosion, protecting homes and business.

### Projected investment and skills demand

**5.59** Total projected expenditure in the flood defence sector from 2015/16 to 2020/21 is forecast at £2.6 billion which results in a relatively constant demand for skills across the period 2015 to 2020, though with large regional programmes the geographical demand varies with time.

### Key features

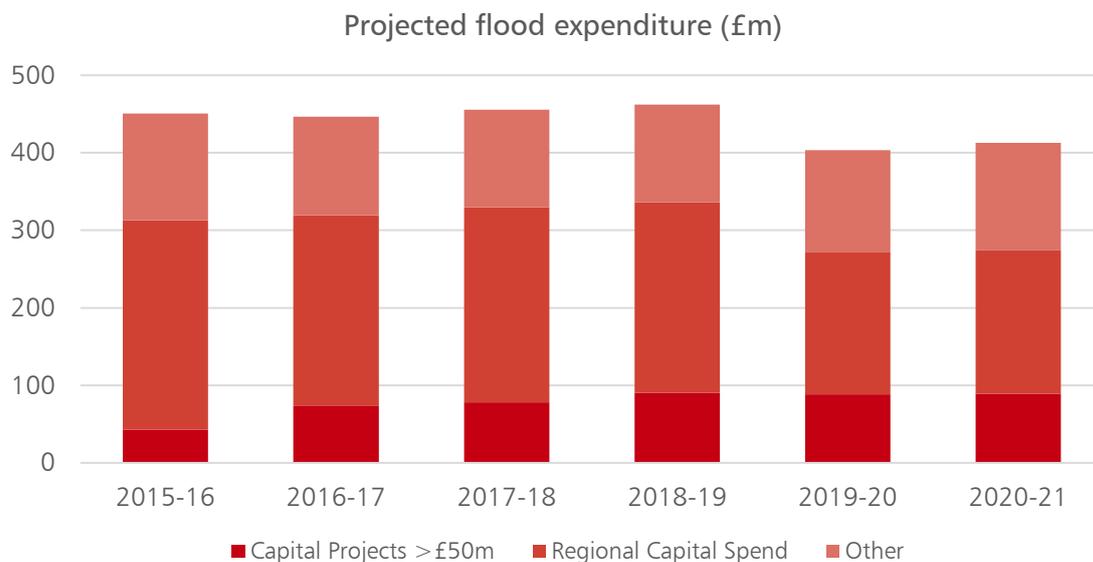
**5.60** For the first time, the government has put in place a long term funded settlement which provides greater visibility and certainty of the forward investment programme, allowing the Environment Agency and the supply chain to plan and co-ordinate the works, bringing a nationally consistent approach to assessing and managing flood and coastal erosion risk.

**5.61** The six year capital investment plan represents a real terms increase in funding and will deliver improved protection to at least 300,000 homes, providing investment in more than 1,400 schemes.

**5.62** Much of the works utilise traditional civil engineering skills, but are now increasingly structured as a co-ordinated programme demanding greater programme management and project leadership capabilities to be in place to maximise delivery. Many of these resources are equally in demand in other sectors.

## Flood defences

### Infrastructure pipeline investment 2015-2020 (£2.6 billion)



### Skills demand 2015-2020

Current workforce: 6,600

Peak workforce: 6,600



Client and project leadership



Engineering and technical



Construction management



Skilled trade and labour

Current	900	2,000	800	2,800
Peak (year)	900 (2015)	2,000 (2015)	800 (2015)	2,800 (2015)

### Key skills challenges

- Building capability to manage integrated programmes of work, including cross-sector projects
- Competition for resources from other infrastructure sectors as investment and delivery levels increase
- Managing the transition from a semi-skilled civil engineering work force to higher technical skills using modern methods of construction
- Improving the attractiveness of the sector to technical and engineering disciplines

# Summary of key challenges

## 6

**6.1** The modelling and analysis demonstrates the overall picture of skills demand across infrastructure projects and programmes, the changing blend of skills required for future delivery and pressures on a number of specialist infrastructure delivery occupations.

**6.2** Whilst some of the volumes of skilled workers may not be large in requirement they are 'mission critical' to the delivery of specific projects within the NIP pipeline and attrition rates are a major concern in some sectors, demonstrating the urgent need to recruit and train new entrants and retrain and up-skill the existing workforce.

**6.3** Based on the analysis of demand across sectors, regions and occupational groups, the challenges faced can be grouped under five main themes.

### Key challenges

Key challenges	Action theme
<ul style="list-style-type: none"> <li>Increasing investment levels stretching capacity and capability within sectors</li> <li>Competition for scarce resources across sectors, particularly as major investment programmes ramp up towards the end of the decade</li> <li>Shortages of key plant and materials having the potential to impact delivery, including from international projects</li> <li>Building capability to manage integrated programmes of work, including cross-sector projects</li> </ul>	<p><b>Providing leadership and coordination</b></p>
<ul style="list-style-type: none"> <li>Integrating demand from non-infrastructure projects with skills planning, particularly within regions</li> <li>Building understanding of critical pinch point skills essential to delivery</li> <li>Improving understanding of demand in client, project leadership and technical roles required to prepare projects for construction</li> <li>Understanding potential impacts of new technology and delivery approaches, including the use of Building Information Modelling (BIM), demanding non-traditional delivery skills</li> </ul>	<p><b>Improving data on supply and demand</b></p>
<ul style="list-style-type: none"> <li>Helping the supply chain adapt to enable the development of the skills and products required to deliver the changing blend of works in the future programme</li> <li>Ensuring procurement and engagement approaches provide appropriate incentives to industry to retrain and up-skill the workforce to meet future skills demand</li> </ul>	<p><b>Incentivising skills investment through procurement</b></p>

Key challenges	Action theme
<ul style="list-style-type: none"> <li>• Ensuring skills built on current successful projects and required for future projects are not lost to the industry</li> <li>• Improving the ability of workers to move across sub-sectors and projects without the need for bespoke training</li> <li>• Improving utilisation of skilled workers from other sectors into infrastructure delivery roles</li> <li>• Managing the transition from a semi-skilled civil engineering work force to higher technical skills suited to using modern methods of construction</li> </ul>	<p><b>Improving mobility and up-skilling the existing workforce</b></p>
<ul style="list-style-type: none"> <li>• Creating opportunities for local companies and disadvantaged and underrepresented local people to benefit from investment in infrastructure</li> <li>• Delivering the long-term investment programme with a large proportion of critical skills approaching retirement age.</li> <li>• Addressing the perception of attractiveness of industry to new recruits</li> </ul>	<p><b>Encouraging young people and greater diversity</b></p>



### **HM Treasury contacts**

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