Procuring Net Zero Construction

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1 Recommendations for net zero carbon procurement

Building and construction operations are estimated to be responsible for 39% of all carbon emissions in the world[1], increasing by 2% to a record high from 2017 to 2018.[2] For the construction sector to ensure that its procurement practices achieve net zero carbon targets is not an option, it is an imperative, and significant procurement changes are required to ensure that net zero solutions are adopted as the new industry norms.

Despite a wealth of evidence showing the improved outcomes that are achieved through more integrated procurement approaches, many in the construction industry continue to allow their clients to remain stuck in lowest price, single stage bid processes and risk dumping contractual provisions that do little or nothing to deliver net zero objectives or other measures of improved value. To borrow the words of Leonard Cohen, all those clients, advisers and industry professionals who understand the need for change should be as *'stubborn as those garbage bags that time cannot decay*'[3] in promoting the need for more intelligent and demonstrably more efficient procurement options.

This report explores how clients, their advisers and all organisations who work in the construction sector can improve their construction procurement practices in order to achieve net zero carbon greenhouse gas ('*GHG*') emissions, and it shows how better results can be achieved through an integrated approach to procurement strategies, team selection, contracts and management. The research leading to this report is part-funded by the Society of Construction Law and was led by Professor David Mosey[4], Darya Bahram[5], Dr Roxana Vornicu[6] and Dr Paolo Ettore Giana[7] on behalf of the King's College London Centre of Construction Law & Dispute Resolution.

This report assesses the **challenge of net zero** (Section 2) and explains how the following recommendations increase the ability of the construction sector to meet net zero carbon targets:

- **Client strategy and expectations** (Section 3)**:** The construction procurement strategy should clearly state the client's commitments to tackling climate change and the ways in which the client expects these to be matched by commitments from the construction industry.
- **Team evaluation and bidder proposals** (Section 4)**:** The system for the selection of construction team members should use balanced evaluation criteria that take into

[1] World Green Building Council https://www.worldgbc.org/embodied-carbon#:~:text=Buildings%20are%20currently%20responsible%20for,11%25%20from%20materials%20and%20construction.

[2] UN 2019 *Global Status Report for Buildings and Construction Report*, https://www.unenvironment.org/resources/publication/2019-global-status-report-buildings-and-construction-sector.

[3] Cohen, L. '*Democracy*', 1992.

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account net zero carbon proposals submitted by prospective consultants, contractors and supply chain members, and should make clear the procedures by which the approved net zero carbon proposals from successful bidders will be developed, agreed and implemented.

- **Early supply chain involvement and preconstruction activities** (Section 5): Contractors and supply chain members should be appointed early during the pre-construction phase of a project on the basis of clear contractual systems through which they work with the client and consultants in developing and agreeing viable and affordable net zero carbon proposals in line with the client's stated brief and budget as preconditions to commencement of the construction phase of the project.
- **Long-term contracts and industry investment** (Section 6)**:** The construction procurement strategy, team selection processes and construction contracts should make clear how long-term contracts will be awarded for pipelines of work that will attract industry investments in net zero carbon through innovations such as offsite manufacture.
- **Specialists and supply chain collaboration** (Section 7)**:** Clients, consultants and contractors should commit to contractual systems by which they explore systematically the best ways for specialist supply chain members to contribute their net zero carbon expertise and the best ways for local and regional supply chain members to offer a lower carbon footprint.
- **Contract governance and joint risk management** (Section 8)**:** Clients should ensure that their construction contracts include a definition of sustainability that includes net zero carbon and describe systems of collaborative governance and joint risk management by which the client, consultants, contractors and supply chain members will work together and individually to achieve net zero carbon and other sustainable outcomes.
- **Framework alliances and shared learning** (Section 9): Clients, consultants, contractors and supply chain members should create multi-party 'Gold Standard' framework alliances through which to integrate the net zero carbon commitments of multiple parties on multiple projects and through which to share learning while protecting intellectual property rights and other confidential information.
- **Whole life procurement and digital information** (Section 10): Clients, consultants, contractors and supply chain members should agree and implement net zero carbon commitments to whole life procurement through digital information management supported by a multi-party contractual integrator that governs exchanges of accurate data in relation to design, cost, time, risk and operation.
- **Action plans and leadership** (Section 11): Clients and consultants should lead and manage the implementation of net zero carbon objectives under new and existing construction contracts, including through the agreement of net zero carbon action plans with binding timetables.

The recommendations in this report can be adopted in any common law or civil law jurisdiction. They draw on the collaboration between the UK government and construction industry that led to the December 2020 '*Construction Playbook'* and to which King's College London Centre

of Construction Law contributed[8]. The recommendations also draw on evidence that includes the following research undertaken by the King's College London Centre of Construction Law from 2013 to 2022 to test and develop the ways that procurement systems and construction contracts can improve economic, social and environmental value:

- '*Trial Projects'* led by Cabinet Office and Constructing Excellence from 2013 to 2017[9]
- '*Enabling BIM Through Procurement and Contracts',* a 2016 report part-funded by the Society of Construction Law[10]
- The 2016 '*FAC-1 Framework Alliance Contract',* a standard form contractual integrator that defines *'Sustainability'* as a feature of '*Improved Value'* and has been used in multiple common law and civil law jurisdictions [11]
- A 2018 *'Research Report and Draft Model Forms for Long-Term Strategic Relationships for the CLC Innovation in Buildings Workstream'* [12]
- '*Constructing the Gold Standard'*, a 2021 independent review of public sector construction frameworks[13] which was a policy commitment in the *Construction Playbook*
- *'Guidance on Collaborative Procurement for Design and Construction to Support Building Safety'*, a 2022 guide prepared for the Department of Levelling Up Housing and Communities[14]
- A 2022 *'White Paper on Procurement Strategies for Incentivizing Collaborative Delivery to Optimize Whole-life Outcomes*', comprising the outcomes from two years of research for the Centre for Digital Built Britain.[15]

A cornerstone of achieving net zero carbon targets will be to capture and apply incremental learning from project to project, and this learning depends on procurement practices that ensure commercially robust systems of collaboration among multiple parties on multiple projects. Otherwise, despite the best efforts of designers and other innovators, the members of each project team will continue to offer separate net zero solutions devised for each new project, trapped in *'the 'Groundhog Day' of lost learning from one project to the next'.*[16] In addition, if collaborative approaches to net zero learning comprise only general principles that are not supported by clear procurement and contractual systems, they will be undermined by the corrosive effects of mistrust and will drift the same way as many other collaborative initiatives

[8] *The Construction Playbook Government Guidance on sourcing and contracting public works projects and programmes of work,* Version 1.0, December 2020 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/941536/The_Construction_Playbook.pdf

[9] https://constructingexcellence.org.uk/wp-content/uploads/2018/12/Trial-Projects-Working-Group-final-report-2017.pdf

[10] Mosey, D., Bahram, D., Howard, C., https://www.kcl.ac.uk/law/research/centres/construction/enabling-bim/ebimtpac-form.aspx

[11] Mosey, D., https://www.kcl.ac.uk/construction-law/activity and https://allianceforms.co.uk

[12] Mosey, D., Bahram, D., https://www.kcl.ac.uk/construction-law/activity

[13] Mosey, D., *Constructing the Gold Standard, an Independent Review of Public Sector Construction Frameworks*, 2021, https://www.gov.uk/government/publications/an-independent-review-of-public-sector-construction-frameworks

[14] Mosey, D. and Poynter-Brown, R., *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety*, 2022 https://www.gov.uk/government/publications/collaborative-procurement-guidance-for-design-and-construction-to-support-building-safety

[15] Mosey, D., Bahram, D., Vornicu, R., Giana, P., Middleton, C. https://www.kcl.ac.uk/construction-law/activity

[16] *Constructing the Gold Standard*, p.3.

- into *'the 'Bermuda Triangle' of idealistic debate, cynical criticism and unrealised good intentions'*.[17]

Effective collaboration and learning to implement net zero policies and strategic commitments require an integrated approach to construction procurement through the *'Four I's'* of intention, information, integration and incentivisation. The *Four I's* are illustrated in **Figure 1** and give rise to the following questions that net zero construction procurement practices need to address:
Intention – How do clients and advisers establish an appropriate **strategy** for obtaining improved environmental value throughout the lifecycle of a construction project or programme of work?
Information- What information needs to be exchanged during the **procurement** process in order to help clients, advisers, consultants, contractors and supply chain members (including subcontractors, manufacturers, suppliers and operators) to understand each other's positions and to reconcile their differing interests in ways that will achieve net zero outcomes?
Integration – How are relationships between clients, consultants, contractors and supply chain members integrated through **contracts** so as to ensure that exchanges of ideas, information and learning take place at the times when they will be of most value in achieving net zero outcomes?
Incentivisation – How will **management** motivate clients, consultants, contractors and supply chain members to honour their mutual commitments to achieve net zero outcomes?

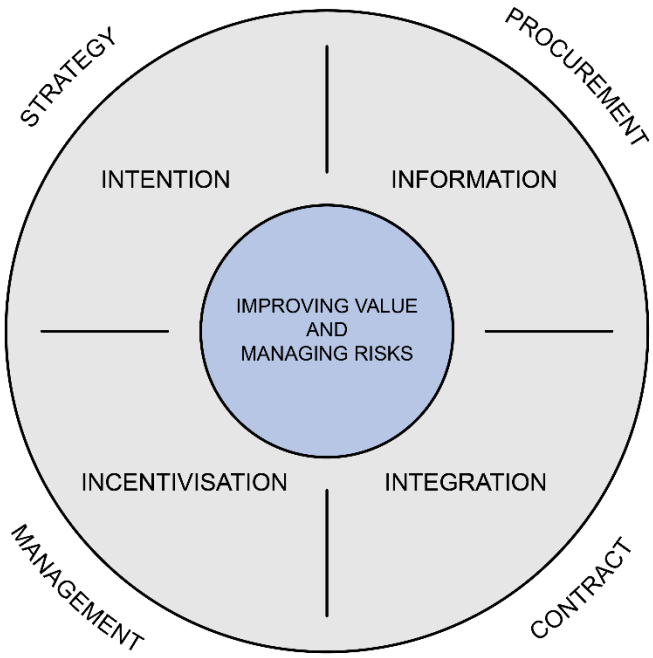

Figure 1: The *Four I's* of a construction project or programme of work[18]

This report identifies and explains the ways in which the carbon reduction commitments and innovations of individual organisations can be supported by a more integrated approach to

[17] *Constructing the Gold Standard*, p.4.
[18] *Constructing the Gold Standard*, p.17.

procuring projects and programmes of work. A new approach is essential because important commitments and innovations are being lost or inhibited where:

- Net zero objectives are too vague to be converted into project deliverables
- Net zero proposals are not assessed in sufficient detail to establish their viability and are discounted as too costly or complex
- Net zero achievements on individual projects are not shared in ways that create learning and develop new norms.

Professional advisers have a crucial role to pay in creating the procurement processes and contractual systems that are most effective in reducing carbon emissions. For example, a group of legal professionals have created a '*Climate Contract Playbook*'[19] that proposes ways to focus greater attention on tackling climate change including:

- Amendments to standard form construction contracts through new clauses covering '*Energy Efficiency and Environmental Obligations*', '*Green Project Modifications*' and *'Green Design and Construction Standards'*[20]
- Creation of a *´Carbon Budget´* alongside the traditional financial budget for construction projects in order to incentivise the industry to reduce GHG emissions across the project lifecycle.[21]

These proposals are valuable, but they cannot deliver significant impact unless they form part of a fully integrated set of construction procurement and contracting systems. This report therefore describes the ways in which legal and procurement advisers can create and support a more holistic approach to delivering construction sector net zero carbon commitments. It examines a range of actions that all professional advisers should take when planning and documenting the procurement of any project or programme of work.

> *'The greatest difference we can make is through the advice and solutions we offer our clients and communities – from helping city leaders take practical steps to meet the Paris Agreement, to working with property developers to understand how digital technology can reduce their resource consumption.'* **Arup**[22]

In December 2021 the UK government committed to implement the recommendations published in '*Constructing the Gold Standard*'[23], Professor David Mosey's independent review of public sector construction frameworks which includes proposals for frameworks and framework contracts to address climate change. *Constructing the Gold Standard* explains how procurement and legal advisers should provide for net zero carbon in their procurement models and contracts through systems such as:

[19] *Climate Contract Playbook*, Edition 3 September 2020, The Chancery Lane Project, Climate Contract Playbook Ed 3.pdf
[20] https://chancerylaneproject.org/climate-clauses/ pp. 184,187,191.
[21] https://chancerylaneproject.org/climate-clauses/, p. 197.
[22] https://www.arup.com/news-and-events/arup-commits-to-net-zero-across-global-operations-by-2030
[23] Mosey, D., *Constructing the Gold Standard, an Independent Review of Public Sector Construction Frameworks*, 2021, https://www.gov.uk/government/publications/an-independent-review-of-public-sector-construction-frameworks

- Early supply chain involvement[24]
- Supply chain collaboration[25]
- Governance and joint risk management[26]
- Framework alliances[27]
- Digital information management[28]
- Action plans and timetables[29].

In relation to the role of procurement and legal advisers, *Constructing the Gold Standard* states that *'Many review participants comment that the advisers who draft framework contracts seem remote from strategic commercial objectives, and that their work seems to focus primarily on the fear of regulatory challenge and the illusory attraction of risk transfer. Procurement and legal advisers have a lot to offer in creating Gold Standard framework contracts, but they need to be briefed to apply a more creative and balanced approach.*'[30]

The first net zero carbon challenge for procurement and legal advisers is to overcome the prevailing inefficient adherence of the construction sector to the single stage, lowest price tendering of one project at a time and to the use of contracts primarily as a tool for risk transfer and administration. This requires advisers to be equipped with evidence that demonstrates how alternative procurement models and contracts deliver better outcomes, not only in terms of net zero carbon but also in terms of other measures of improved value and reduced risks.

2 The challenge of net zero

Combatting climate change is the greatest challenge of our time and there are key roles to be played by the construction industry, its clients and their procurement and legal advisers. The 2016 Paris Agreement required that global carbon emissions must be at net zero by 2050.[31] The UK Department for Business, Energy and Industrial Strategy defines *'net zero carbon'* outcomes as those where *'any emissions would be balanced by schemes to offset an equivalent amount of greenhouse gases from the atmosphere'*.[32]

The statutory duties of all UK company directors include a duty to have regard to *´the impact of the company´s operations on the community and the environment.´*[33] However, these duties cannot be fulfilled by any construction organisation acting alone, and the net zero strategies and systems that each company adopts need to be integrated with those of multiple other parties across the successive stages of planning, design, construction, operation and demolition that comprise the lifecycle of each asset.

[24] Section 5 of this report.
[25] Section 7 of this report.
[26] Section 8 of this report.
[27] Section 9 of this report.
[28] Section 10 of this report.
[29] Section 11 of this report.
[30] *Constructing the Gold Standard*, p.24.
[31] Energy & Climate Intelligence Unit: *Net zero: why is it necessary?* https://eciu.net/analysis/briefings/net-zero/net-zero-why
[32] *Net Zero Strategy: Build Back Greener*, October 2021 p.209, https://asbp.org.uk/asbp-news/net-zero-strategy
[33] Companies Act 2006, Section 172.1 (2).

2.1 Whole life net zero carbon

The November 2021 COP 26 summit sought to accelerate action towards the goals of the Paris Agreement and recognised the need for the construction sector to deliver powerful net zero solutions. For example, the UK Green Building Council launched its *'Net Zero Whole Life Carbon Roadmap'* at COP 26, drawing together different policies and commitments into coherent recommendations for national governments, local authorities, the private sector and the construction industry.[34]

A whole life carbon assessment includes the evaluation of carbon emissions of an asset from its construction through to its demolition and **Figure 2** shows the activities that are involved. Building sustainable assets entails moving to a whole lifecycle approach which encompasses appropriate engineering and design solutions plus accurate judgements that balance reductions in operational and embodied carbon against other measures of value. Each construction project needs to be conceived with a whole life carbon reduction plan from the outset, allowing the design, construction and operational teams to make the right decisions.

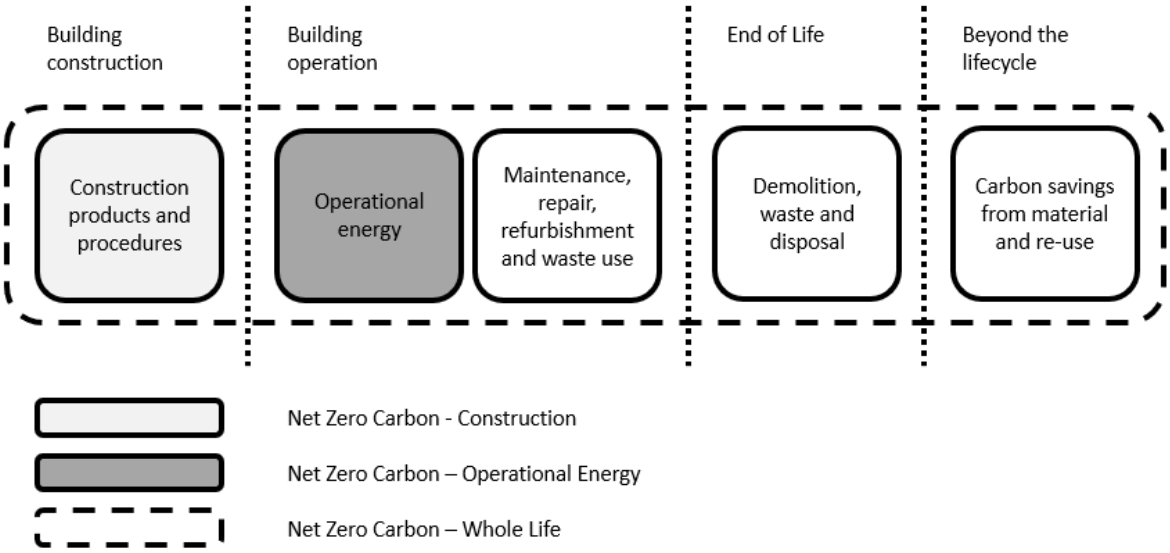

Figure 2: The impact of net zero carbon during the life cycle of an asset[35]

The *Net Zero Whole Life Carbon Roadmap* identifies five key net zero carbon priorities that government and industry need to support and implement, namely:

> *'1. Nation-wide retrofitting of existing homes. To transform UK housing so it is efficient, warm, and cheaper to heat, whilst phasing out fossil fuel heating.*
> *2. Energy performance disclosure for nondomestic buildings. To ensure that real-world performance of assets is visible to the market, and can influence asset valuation, market transactions, and management decisions.*

[34] https://www.constructionnews.co.uk/sustainability/cop26-building-regs-reform-set-out-to-drive-carbon-revolution-12-11-2021/
[35] BS EN 15978:2011 *Sustainability of construction works. Assessment of environmental performance of buildings.*

3. Adoption of a design for performance approach. To shift away from the theoretical "notional building" approach and to focus on how energy intensive buildings will be built in practice, alongside other key net zero enablers such as peak demand limits.
4. Whole life carbon measurements and agreed limits. To start with mandatory measurement, followed by the phased introduction of embodied carbon limits for new buildings to reduce demand, alongside changes to planning and VAT to incentivise the reuse of existing buildings.
5. National infrastructure investment based on the net emissions impact. To consider all forms of carbon, alongside a policy framework and investment to drive industrial decarbonisation of key construction.'[36]

2.2 New and existing buildings

In *´From Thousands to Billions - Coordinated Action towards 100% Net Zero Carbon Buildings By 2050´*, the World Green Building Council calls for:

- All new buildings to operate at net zero carbon from 2030
- All new and existing buildings to operate at net zero carbon by 2050.[37]

To achieve these zero carbon targets requires the construction of new ultra-low energy buildings. The 2020 UN '*Global Status Report for Buildings and Construction'* shows that the world's building stock is set to double by 2050, and how it is therefore essential that all new buildings have net zero carbon emissions. [38]

Actions to improve existing buildings are among the most cost-effective means of reducing global emissions.[39] The *Net Zero Whole Life Carbon Roadmap* estimates that 80% of existing buildings will still be in use in 2050 [40] and states that:

- *'The scale of the existing retrofit challenge is significant and continuing to deliver new buildings which fall short of net zero standards will only add to this challenge in the coming years, locking buildings into a pathway towards an unnecessary future retrofit.*
- *Considering carbon reduction as early as possible within the design process minimises cost impacts and leads to better design integration.*
- *This will avoid the need for future retrofitting and remove the risk of future occupant disruption, cost and embodied carbon emissions´.*[41]

In the UK, the energy consumption of existing buildings accounts for around 34% of annual carbon emissions,[42], and the retrofitting of existing buildings through new technologies,

[36] https://www.ukgbc.org/ukgbc-work/net-zero-whole-life-roadmap-for-the-built-environment/
[37] *From thousands to billions*: *Coordinated Action towards 100% Net Zero Carbon Buildings By 2050*, World Green Building Council, 2020, https://www.worldgbc.org/sites/default/files/From%20Thousands%20To%20Billions%20WorldGBC%20report_FINAL%20issue%20310517.compressed.pdf
[38] UN 2020 *Global Status Report for Buildings and Construction Report*. https://globalabc.org/sites/default/files/inline-files/2020%20Buildings%20GSR_FULL%20REPORT.pdf
[39] *Pathways to a Low-Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve*, McKinsey & Company, 2010.
[40] https://www.ukgbc.org/climate-change-2/
[41] https://www.ukgbc.org/ukgbc-work/net-zero-whole-life-roadmap-for-the-built-environment/, Introduction.
[42] https://www.theccc.org.uk/wp-content/uploads/2014/08/Fact-sheet-buildings-updated-July-2015.pdf

improved energy efficiency and more effective building management systems should be a major priority.[43] The UK Government led a public consultation from October 2019 to February 2020 on a *´Future Buildings Standard´*,[44] and responses suggested that *´we need to be retrofitting 20,000 homes per week to meet net zero carbon energy standards´*.[45]

2.3 Government leadership

Governments have a responsibility to demonstrate their commitment to achieving net zero carbon and to lead the way in showing how this can be done. The UK was the first developed economy to commit to reach net zero greenhouse gas emissions by 2050.[46] The European Union has also committed to reach the net zero target by 2050 and proposes a '*European Climate Law'* that will translate political commitments into legal obligations.[47]

The UK government´s *Net Zero Strategy: Build Back Greener* states that the government is *´determined to leverage public procurement to help achieve net zero'* and will use its *´buying power to drive decarbonisation and to create the policy tools and training to enable public procurers to grasp this opportunity.´*[48] For example, from October 2021 all companies bidding for UK government contracts worth more than £5 million per annum must commit to achieving net zero emissions by 2050[49]. Under the new rules, in-scope organisations need to produce a carbon reduction plan detailing their carbon emissions and their environmental management measures for:

- *'Scope 1 - This one covers the Green House Gas (GHG) emissions that a company makes directly- for example while running its boilers and vehicles*

- *Scope 2- These are the emissions it makes indirectly – like when the electricity or energy it buys for heating and cooling buildings, is being produced on its behalf*

- *Scope 3- Now here's where it gets tricky. In this category go all the emissions associated, not with the company itself, but that the organisation is indirectly responsible for, up and down its value chain. For example, from buying products from*

[43] https://www.pbctoday.co.uk/news/energy-news/retrofitting-existing-buildings/71677/
[44] https://www.gov.uk/government/consultations/the-future-buildings-standard
[45] https://www.iesve.com/discoveries/blog/15023/future-buildings-standard-consultation
[46]The Climate Change Act 2008 (2050 Target Amendment) Order 2019 https://www.legislation.gov.uk/ukdsi/2019/9780111187654
[47] Proposal for a regulation of the European Parliament and of the Council establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999 (European Climate Law), COM/2020/80 final, available here: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020PC0080
[48] *Net Zero Strategy: Build Back Greener*, p.248, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1033990/net-zero-strategy-beis.pdf.
[49] Procurement Policy Note 06/21: *Taking account of Carbon Reduction Plans in the procurement of major government contracts* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/991622/PPN_0621_Taking_account_of_Carbon_Reduction_Plans__2_.pdf . PPN/ 06/21 includes, '*as a selection criterion, a requirement for bidding suppliers to provide a Carbon Reduction Plan (using the template at Annex A) confirming the supplier's commitment to achieving Net Zero by 2050 in the UK, and setting out the environmental management measures that they have in place, and which will be in effect and utilised during the performance of the contract.'*

its suppliers, and from its products when customers use them. Emissions-wise, Scope 3 is nearly always the big one'.[50]

Recent UK legislation, regulations and related proposals designed to drive a net zero carbon approach to construction include:

- Proposed amendments to the Building Regulations (July 2021) to create a new Part Z '*Whole life Carbon'* requiring, incrementally for different buildings from 2023 to 2027, that *'Whole life carbon emissions shall be assessed and reported for the building and any other parts of the project where Building Regulations apply'* and that *'Reasonable provision shall be made for the minimisation of carbon emissions.'*[51]
- *'National Planning Policy Framework*' (July 2021) which provides for sustainable development through a planning system with interdependent economic, social and environmental objectives, the third of these being *'to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'*. [52]
- Housing, Communities and Local Government Select Committee report on *'Local Government and the path to net zero'* (October 2021), whose recommendations include that '*The local government net zero delivery framework should clarify the critical role local government must play in delivering a just transition to net zero that benefits all communities'* and that *'the Government come up with a plan for funding local authority climate action in a way that gives councils the confidence and ability to plan for the long term'*, [53] plus the government's response to these recommendations (January 2022)[54]
- Environment Act (November 2021) which includes provisions *'about targets, plans and policies for improving the natural environment; for statements and reports about environmental protection; for the Office for Environmental Protection; about waste and resource efficiency; about air quality; for the recall of products that fail to meet environmental standards; about water; about nature and biodiversity; for conservation covenants; about the regulation of chemicals; and for connected purposes.'*[55]

[50] https://www2.deloitte.com/uk/en/focus/climate-change/zero-in-on-scope-1-2-and-3 emissions.html?gclid=CjwKCAiAyPyQBhB6EiwAFUuakmdRt1OHmBxYFXTZY887JZSMlQQeveZZY6k4g4pPP_4TCRxN1CUxDhoCtncQAvD_BwE

[51] https://static1.squarespace.com/static/60d9f44f29825255def91a2f/t/60f1b7dd472b246e7d602bfd/1626453985613/AD-Z+Proposal+20-07-2021+rev0.pdf

[52] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf

[53] https://committees.parliament.uk/publications/7690/documents/80183/default/

[54] https://www.gov.uk/government/publications/local-government-and-the-path-to-net-zero-government-response-to-the-select-committee-report/local-government-and-the-path-to-net-zero-government-response-to-the-select-committee-report

[55] https://www.legislation.gov.uk/ukpga/2021/30/enacted/data.pdf

2.4 Industry leadership

'*COnstructZero*'[56], published by the UK Construction Leadership Council in response to the government´s 10-point plan for a Green Industrial Revolution[57] , emphasises the need for the construction industry to work together more effectively and efficiently. The UK Green Building Council's *Net Zero Whole Life Carbon Roadmap* includes a '*Stakeholders Action Plan'* stating that clients, developers and contractors should take immediate actions to:

- Review and establish internal carbon pricing mechanisms that embed climate risks within investment evaluations
- Establish Whole Life Carbon ('*WLC*') as a first order consideration in initial site development appraisals and decision-making
- Establish a Net Zero Carbon client brief which embeds an outcome-focused *´design for performance´* approach through design and procurement, sets targets for energy intensity metrics, sets embodied carbon targets and establishes *WLC* as a primary decision-making metric to be evaluated at each RIBA Stage.[58]

The *Stakeholders Action Plan* states that contractors should work with their supply chains to set operational and embodied carbon reduction targets and to require mandatory disclosure of supply chain data[59]. Meanwhile, a 2021 report by the World Economic Forum shows how construction supply chains account for more than 10% of global CO2 emissions[60] and describes the need for immediate changes that include greater recycling of cement, aluminium and plastics from demolition waste.[61]

> *'Achieving a positive whole life carbon outcome requires collaboration across a broad range of stakeholders throughout the lifecycle. There is an enormous amount that can be enabled in the design stages of a project – the impact of effective collaboration between developer and designer can be felt right through operation, refurbishment and into end of life and de-construction'.* **Arup** *The Road to Zero*[62]

In June 2021 the UK Construction Leadership Council published their '*Carbon Reduction Code for the Built Environment*', which:

- Is intended to *'facilitate the reduction of carbon emissions (CO2 eq) related to design, construction, maintenance, operation and decommissioning of built assets'*

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[56] *CO2nstruct zero: The construction sector's response to the prime minister's net zero challenge*, CLC 8 March 2021:https://www.constructionleadershipcouncil.co.uk/news/clc-seeks-industry-support-to-drive-delivery-of-net-zero-in-the-built-environment/

[57]*The Ten Point Plan for a green Industrial Revolution – Building back better, supporting green jobs, and accelerating out path to net zero*, OGL November 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

[58] *Net Zero Whole Life Carbon Roadmap Stakeholder Action Plans*, p.5. https://www.ukgbc.org/wp-content/uploads/2021/11/UKGBC-Whole-Life-Carbon-Roadmap-Stakeholder-Action-Plans.pdf

[59] https://www.ukgbc.org/ukgbc-work/net-zero-whole-life-roadmap-for-the-built-environment/

[60] *Net-Zero Challenge: The supply chain opportunity*, https://www.weforum.org/reports/net-zero-challenge-the-supply-chain-opportunity .

[61] *Net-Zero Challenge: The supply chain opportunity*, p. 38.

[62]https://www.arup.com/-/media/arup/files/publications/n/net-zero-carbon-buildings-three-steps-to-take-now.pdf

- Was described as *'a first step to facilitate action and collaboration by relevant parties towards reducing carbon emissions (CO2 eq) related to design, construction, maintenance, operation and decommissioning of built assets'*
- *'Is not intended to replace standards such as PAS 2080 (or equivalent), but provides a framework for organisations to make a public commitment to and report on progress towards achieving Net Zero'*.[63]

2.5 Measuring carbon reduction

The underlying question in the *Carbon Reduction Code*, and in all the net zero carbon obligations of construction clients and industry, is how to frame measures of carbon reduction so as comply with the new obligations in ways that are consistent, objective and agreed in advance.

Clear carbon reduction measures need to be committed to by clients and industry at each stage in the strategy, procurement, contracts and management of a project or programme of work. Carbon reduction can then be assessed transparently as part of an objective contractual performance measurement process, supported by agreed systems through which the team members can examine and seek to correct any shortfall in achieving agreed targets[64]. The agreement of suitable measures is still evolving, and the *Building Research Establishment's Environmental Assessment Method* ('*BREEAM*') describe commitments to:

- *'Work with and support industry in achieving greater consensus on how to achieve net zero carbon*
- *Develop and test proposals for a new 'zero whole life carbon' methodology prioritising the new construction schemes*
- *Map alignment between BREEAM schemes and carbon reduction pathways, starting with CRREM* [Carbon Risk Real Estate Monitor]
- *Develop and test proposals for a new net zero carbon verification service, operationally as well as technically'*[65].

PPN6/21 includes an illustrative '*Carbon Reduction Plan Template'* that refers to *'environmental management measures such as certification schemes like ISO14001 or PAS 2060, signing up to SBTI* [Science Based Targets initiative] *or specific measures you have taken such as the adoption of LED* [light-emitting diode] */PIR* [passive infrared] *lighting controls, changes to policy resulting in a reduction in company travel and flights or the electrification of the company fleet.*'[66]

In the infrastructure sector, the British Standards Institute PAS2080 provides '*a global standard for managing infrastructure carbon'* so that '*carbon is consistently and transparently quantified at key points in infrastructure delivery which promotes sharing of data along the value chain'*[67]. Guidance on PAS2080 from the Construction Leadership Council and the Green Construction Board lists the interconnected responsibilities of the

[63] https://www-smartinfrastructure.eng.cam.ac.uk/files/carbonreductioncode-issue_1.0_june_2021.pdf
[64] As considered, for example, in Sections 8 and 11 of this report.
[65] https://www.breeam.com/building-back-better/
[66] Procurement Policy Note 06/21: *Taking account of Carbon Reduction Plans in the procurement of major government contracts.*
[67] https://www.carbontrust.com/what-we-do/assurance-and-certification/pas-2080-carbon-management-in-infrastructure

'*Asset Owner/Manager'*, '*Designer*s', '*Constructor*s' and *'Suppliers'* during each stage of the *'Strategy', 'Brief', 'Concept and Definition', 'Design', 'Construction and Commissioning', 'Handover and Closeout', 'Operation'* and *'End of Life'* of an asset and includes numerous case studies and illustrative carbon reduction measures. [68]

'PAS 2080 has the power to transform the benefits that the UK gains from its infrastructure assets. If all parties involved across the value chain work collaboratively and towards a common goal to reduce carbon, the following outcomes can be achieved:
• A reduction in the costs of delivering and maintaining our infrastructure – driving more efficient ways of working and helping us to have an even greater impact on society and the communities that we serve.
• Effective carbon management – an important contribution to tackling climate change and leaving a positive legacy for future generations.
• Delivering more sustainable solutions at lower cost – enhancing the reputation of the industry, generating pride for those who work in it and attracting new people and skills to strengthen our capabilities.
• A platform for innovation to thrive – leading to more vibrant and rewarding workplaces.'
Skanska, Green Construction Board and Infrastructure Working Group[69]

2.6 A new approach to procurement and contracts

Commitment to net zero obligations is not only a matter of creating new legal obligations and defining clearer measures. Guidance on PAS2080 also emphasises the need for a strategic and collaborative approach to construction procurement, citing the *'benefits of early engagement'* whereby *'all organizations involved in infrastructure delivery engage with each other at the earliest possible stage and ideally – to drive positive change in the industry – engage outside of specific infrastructure projects. This early engagement will allow the organizations fulfilling the different value chain roles to better understand the services and products required in the infrastructure sector and to proactively develop these'.*[70] To achieve the benefits of strategic early engagement requires major changes in the procurement models and contracts that currently comprise the default position for construction projects in every jurisdiction.

Leading voices from the construction sector at COP 26 examined '*How can construction contribute to solving the climate crisis?'* and called on:

- *'National and subnational governments around the world to adopt a* ***life cycle approach*** *to the reduction of emissions from buildings, and ensure that embodied emissions get addressed from the* ***early stages of planning and building design****, and*
- *Businesses in the building sector to commit to* ***radical collaboration across the value chain*** *in order to develop, promote and adopt sustainable building practices that achieve the reduction of embodied carbon in buildings* ***at scale and without delay****.'*[71]

This report identifies the improvements in construction procurement and contracting that are necessary to create and implement the required '*life cycle approach'*, to address the issues from

[68] file:///C:/Users/K1217231/AppData/Local/Temp/Guidance-Document-for-PAS2080_vFinal.pdf
[69] file:///C:/Users/K1217231/AppData/Local/Temp/Guidance-Document-for-PAS2080_vFinal.pdf
[70] file:///C:/Users/K1217231/AppData/Local/Temp/Guidance-Document-for-PAS2080_vFinal.pdf.
[71] https://vimeo.com/showcase/8982541/video/644792232 , p.12.

the *'early stages of planning and building design'* and to achieve the required '*radical collaboration across the value chain'* in order to '*reduce embodied carbon in buildings at scale and without delay'*.

In framing how the construction industry and its clients and advisers should improve their current practices, the UK *Construction Playbook* identified key procurement and contracting changes that are necessary to make rapid progress in prioritising net zero procurement. The Playbook has been widely supported by the construction industry,[72] and it establishes 14 new policies to be implemented on a '*comply or explain'* basis linked to public spending controls. It requires that all contracting authorities *'should set out strategies and plans for achieving net zero GHG emissions by or ahead of 2050 for their entire estate/ infrastructure portfolio.'*[73]

> *Getting government, city leaders, clients and fellow professionals pointing in the same direction will help decouple economic success from negative impacts and align it with positive social and environmental outcomes.'* **Buro Happold Engineering**[74]

The Playbook aims to *´transform how we assess, procure and manage public works and programmes´*, enabling the UK to *´take strides towards the 2050 net zero commitment and focus on a whole life carbon approach to fight climate change and deliver greener facilities designed for the future´*.[75] Its requirements include *'strategies and plans for achieving net zero GHG emissions by or ahead of 2050…aligned under an overarching sustainability framework'*[76] combined with *'systems and processes … to ensure… projects and programmes deliver on the targets set.'*[77]

The Playbook requires that procurement processes obtain and evaluate net zero carbon *'solutions put forward by potential suppliers… accompanied by a whole life carbon assessment'*[78] and that these processes include engagement with '*SMEs'* [small and medium-sized enterprises] who provide '*insights into MMC, innovative technologies and ways to minimise the GHG footprint of the proposed solutions across their whole lifecycle.'*[79]

The Construction Playbook requires a collaborative approach at all stages in the procurement process.[80] It states that *'Trust is key, and it is important that a mutually beneficial, open and collaborative approach is adopted during the process in sharing ideas and innovative solutions'.*[81] The machinery of collaboration is considered throughout this report as a central requirement in order to develop the shared learning that is necessary to achieve whole life net zero carbon. The UK Green Building Council states that *´Achieving net zero whole life carbon will require close collaboration within the supply chain to minimize embodied carbon and*

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[72] *The Construction Playbook 'Compact with Industry'* pp.6,7 confirms support from 48 leading industry bodies.
[73] *Construction Playbook*, p. 5.
[74] https://www.burohappold.com/people/duncan-price-sustainability-and-climate-change-consultant/
[75] *Construction Playbook*, p. 3.
[76] *Construction Playbook*, p.5.
[77] *Construction Playbook*, p. 5.
[78] *Construction Playbook*, p. 23.
[79] *Construction Playbook*, p. 23
[80] *Construction Playbook*, p. 46.
[81] *Construction Playbook*, p. 24.

related liabilities for offsets. Similar to performance contracting for operational energy, this could involve a move towards carbon performance contracting with suppliers. '[82]

3 Client strategy and expectations

The construction procurement strategy should state clearly the client's commitments to tackling climate change and the ways in which the client expects these to be matched by commitments from the construction industry.

The Construction Playbook describes how an outcome-based procurement strategy will deliver improved environmental outcomes and states that:

- An outcome-based strategy will *´help suppliers understand contracting authorities' ambitions without being prescriptive about how to deliver outcomes.*
- *A shared focus on outcomes, rather than scope, will unlock innovation and drive continuous improvement.*
- *Clear and measurable outcomes should be set at the outset of a project or programme.*
- *In developing these, projects and programmes should focus on whole life value.´*[83]

When contracting authorities develop a procurement strategy, the Playbook requires that they should '*analyse information from past projects and programmes'* in order to provide *'decision-makers with key insights and data to make more informed and intelligent investment decisions'* and to *'better understand whole life costs and value*.' [84] In support of this approach the January 2021 Infrastructure and Projects Authority Mandate includes a commitment to '*create a Benchmarking Hub and make benchmarking data available on key assets to underpin and challenge project investment cases.*'[85]

Procurement strategies should adopt an approach to net zero carbon that focuses on outcomes and whole life value alongside cost, time, safety and other measures of performance. Clients need to plan and budget for net zero carbon, using the analysis of information from past projects and programmes to inform their procurement strategy. The Playbook requires that *'Projects and programmes should undertake benchmarking of key project deliverables including cost, schedule, GHG emissions and agreed outcomes at each stage of business case development'*, and that clients should create a '*Should Cost Model'* that provides *'a forecast of what a project or programme 'should' cost over its whole life, including the build phase and the expected design life.*'[86]

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[82] UK Green Building Council, *Net Zero Carbon Buildings: A Framework Definition*, 2019.https://www.ukgbc.org/ukgbc-work/net-zero-carbon-buildings-a-framework-definition/.
[83] *Construction Playbook*, p. 24.
[84] *Construction Playbook*, p.11.
[85] *Infrastructure and Project Authority Mandate*, p. 4. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/949868/IPA_Mandate_2021.pdf
[86] *Construction Playbook*, p.36.

A collaborative procurement strategy: On a five-year, regional, multi-client programme, the National Change Agent housing consortia achieved: '*efficiency savings totalling £226 million from cumulative expenditure of £1.6 billion'* combined with social value such as the *'establishment of numerous SME businesses and social enterprises'* and '*a joint initiative with WRAP to halve waste to landfill.'*[87]

Clients and advisers should undertake pre-procurement consultation that informs their procurement strategy regarding the potential for industry to offer the solutions, technology and innovations that will deliver the required net zero solutions[88]. Attracting and adopting net zero carbon proposals supported by emerging technologies and innovations will depend on a procurement strategy that uses an outcome-based brief combined with evaluation of supplier proposals and a clear understanding as to the treatment of suppliers' intellectual property rights in the net zero proposals that they submit.

A net zero construction procurement strategy should state:

- How net zero proposals from consultants, contractors and supply chain members will form part of the quality criteria that move the evaluation focus away from lowest price and towards a deeper understanding of the bidders' capabilities
- The purpose of seeking competitive supplier net zero proposals, including the processes by which these proposals are reviewed, developed and adopted once a team member is appointed
- How confidentiality and intellectual property rights in net zero proposals will be respected
- By what process the clients, consultants, contractors and supply chain members will seek agreement to share approved net zero proposals with other clients, consultants, contractors and supply chain members
- How the success of consultant, contractor and supply chain proposals in delivering improved net zero outcomes will affect the award of future work and other incentives.[89]

Development projects: *'The London Plan is the statutory Spatial Development Strategy for Greater London and the 32 London boroughs and is prepared by the Mayor of London in accordance with the Greater London Authority (GLA). All major projects are required to meet the net zero carbon target and must show an on-site reduction of at least 35 per cent beyond the baseline of Part L of the current Building Regulations.*'[90]

Health projects: *'The climate emergency is also a health emergency. Leading by example, the NHS – which is responsible for around 4 percent of the nation's carbon emissions – has set out a clear objective of reaching carbon neutrality by 2040.*'[91]

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[87] *Collaborative Construction Procurement and Improved Value*, p.301.
[88] *Construction Playbook*, p.22.
[89] *Constructing the Gold Standard*, p. 7.
[90] https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf
[91] *Delivering a 'Net Zero' National Health Service*, October 2020, National Health Service, p.3. https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2020/10/delivering-a-net-zero-national-health-service.pdf

Procurement strategies should establish clear net zero objectives that can be translated into actions by creating clear lines of communication, commitments and timescales for implementing sustainable solutions that are practical and affordable. They should make clear how net zero carbon commitments will be implemented through the evaluation of supplier proposals, the machinery set out in contracts and the systems used for project and programme management.

4 Team evaluation and bidder proposals

The system for the selection of construction team members should use balanced evaluation criteria that take into account net zero carbon proposals submitted by prospective consultants, contractors and supply chain members, and should make clear the procedures by which the approved net zero carbon proposals from successful bidders will be developed, agreed and implemented.

As with other measures of value, net zero carbon commitments need to be delivered through agreed machinery rather than simply through demands, and procurement machinery is likely to include a competitive process for selecting team members. The success of this process will depend on the full and accurate exchange of relevant information and on the balanced assessment of net zero proposals and other evaluation criteria.

Improved environmental value is consistent with a competitive procurement process if that process is transparent and logically constructed. An effective value-based, net-zero procurement process should:

- Use specifications that focus on the net zero carbon client outcomes
- State how intellectual property rights may arise from supplier proposals and how these intellectual property rights will be managed through the life of the contract
- Evaluate supplier solutions accompanied by whole life carbon assessments and proposals for minimising *GHG* emissions across the lifecycle of the assets procured
- Make clear the criteria for net zero carbon performance measurement, how they will be applied and how they will affect the award of future work and other supplier incentives[92].

Crown Commercial Service, a public sector framework provider, reports that their '*framework specifications emphasise delivery of sustainability through the design process, materials selection, construction techniques and construction methods implemented, supporting 2050 net zero commitments, and ultimately a whole life carbon approach. Suppliers are mandated to identify opportunities to clients on achievement of sustainability objectives. Specifications also contain more detailed requirements, shoring-up these higher-level objectives, for example:*

- *Adopting the application of BRE's Environmental Assessment Methodology (BREEAM)*

[92] *Constructing the Gold Standard*, p 42.

- *Promoting, conserving and enhancing biodiversity, including use of Biodiversity Action Plans or equivalent, and the management of Sites of Special Scientific Interest (SSSIs)*
- *Following the principles of the Green Public Procurement (GPP) voluntary instrument*
- *Adherence to packaging regulations and the reduction of embedded carbon, particular important in Building Materials'.*[93]

Clients should ensure that the selection processes for consultants, contractors and other supply chain members are fair and transparent by ensuring that the appraisal of bidders makes a balanced assessment of net zero proposals alongside other measures of cost and quality that underpin an outcome-based approach focused on whole life value and performance. The Construction Playbook sets a clear principle for the evaluation of bids based on *´better and greener delivery´*, making clear that *´While cost is an important evaluation criterion, there will be many occasions where quality will be weighted higher than cost, recognising the importance of delivering quality public works projects and programmes, or meeting legal obligations such as net zero GHG emissions by 2050.*'[94]

LHC, a public sector framework provider, reports that '*Within recent frameworks we have introduced the LHC Lifetime Values which comprise a set of social, community and environmental measures. In designing the specification and evaluation criteria for the procurement of our frameworks we consider these Lifetime Values, and we ensure that our assessment of bidders' responses support the achievement of these values.*'[95]

The Playbook recognises that clients will need to adopt new evaluation practices in order to achieve a clear understanding of the value that is offered, and it requires that:

- *'Value-based procurement should be adopted at an organisational level and driven through a portfolio approach to projects and programmes'*
- *'Evaluation - and evaluation criteria - should focus on value over cost'*[96]
- *'The quality evaluation criteria need to be sufficiently well developed and detailed to allow for the differentiation in scores between competing bids, to avoid too close or identical scores from bidders.'*[97]

Net zero carbon evaluation criteria should be outcome-based, detailed and measurable rather than vague commitments. They should look closely at a prospective supplier's proposals for achieving net zero carbon and at the evidence that supports the feasibility and affordability of these proposals. An effective net zero procurement process should reflect:

- A clear understanding of value linked to desired and required outcomes
- How these outcomes align to net zero strategy and regulations

[93] *Constructing the Gold Standard*, p.21.
[94] *Construction Playbook*, p.57.
[95] *Constructing the Gold Standard*, p.84.
[96] *Construction Playbook*, p.56.
[97] *Construction Playbook*, p.57.

- A system and criteria that include evaluation of economic, social and environmental value where the requirements are related and proportionate to the subject-matter of the contract.

European public procurement regulations require selection of the '*most economically advantageous tender'* which can '*be identified on the basis of the price or cost, using a cost-effectiveness approach, such as life-cycle costing'*, and can also '*include the best price-quality ratio, which shall be assessed on the basis of criteria, such as qualitative, environmental and/or social aspects, linked to the subject-matter of the public contract in question.*'[98]
To take full advantage of net zero proposals once the team members have been selected, the procurement process and contractual systems should set out how these proposals will be:

- Accepted and implemented at framework level and project level
- Reserved for later review and adoption, at the option of the client
- Shared for wider review and adoption by other suppliers.

In order to attract net zero bid solutions from bidders that can be used for the benefit of the project or programme of work as a whole, the Playbook states that:

- *'It is important to create a common understanding of what IP is and how it might arise from the contract'*
- *'IP should be managed through the life of the contract with clear responsibilities set out in the contract.'*[99]

The Construction Innovation Hub's '*Value Toolkit*' recognises that each project or programme has its own unique value profile by reference to the relative importance of four value categories:

- Natural (air, climate, water, land, resource, use, biodiversity)
- Social (influence and consultation, equality and diversity, networks and connections)
- Human (employment, skills and knowledge, health, experience)
- Produced (lifecycle cost, return, production, resilience).[100]

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[98] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/560263/Guidance_on_Awarding_Contracts_-_Oct_16.pdf . The UK Government´s Green Paper on *´Transforming Public Procurement´* [98] proposes that the evaluation of bids should be based on '*Most Advantageous Tender (MAT)'* and that '*adopting MAT (together with accompanying guidance) should provide greater reassurance to contracting authorities that they can take a broader view of what can be included in the evaluation of tenders in assessing value for money including social value as part of the quality assessment'.* CP 353, para 101 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/943946/Transforming_public_procurement.pdf. See also Directive 2014/24/EU of the European Parliament and Council http://data.europa.eu/eli/dir/2014/24/oj and Directive 2014/25/EU of the European Parliament and Council on procurement by entities operating in the water, energy, transport and postal services sectors, http://data.europa.eu/eli/dir/2014/25/oj.
[99] *Construction Playbook*, p.26.
[100] https://constructioninnovationhub.org.uk/value-toolkit/ . The *Value Toolkit* is being extensively trialled and updated links should become available during 2022.

Procuring for net zero carbon needs to deal with the impact of supplier proposals on cost, time, risk and other project factors. Reconciling these potentially conflicting criteria requires a procurement process that allows sufficient time for the careful examination and agreement of net zero proposals submitted by the selected suppliers. If bidders are asked to put forward net zero proposals that are assessed only in a single stage procurement process, they may hold back or compromise good ideas in order to reduce their bid prices.

In addition, if there is no joint examination by clients and consultants with contractors and supply chain members through which to assess the viability of net zero proposals, then a client may reject those proposals as unaffordable or unbuildable having had no opportunity to investigate them in detail. This is why, in a rapidly evolving marketplace, early conditional appointments of contractors and supply chain members are an essential part of the procurement process in order for clients and their consultants to gain the best insights as to what net zero solutions are on offer.

5 Early supply chain involvement and preconstruction activities

Contractors and supply chain members should be appointed early during the pre-construction phase of a project on the basis of clear contractual systems through which they work with the client and consultants in developing and agreeing viable and affordable net zero carbon proposals in line with the client's stated brief and budget as preconditions to commencement of the construction phase of the project.

The search for net zero carbon solutions requires innovations and efficiencies to be developed and embedded not only in the work of design consultants but also in the work of contractors, subcontractors, manufacturers and operators. The Construction Playbook states that *´Projects and programmes should engage in innovative thinking from the start through early engagement. Research and innovation-based procedures which go beyond engagement to inviting the market to suggest novel solutions to problems should also be considered.´*[101] It requires that '*operators should be engaged early and continuously'* in the project lifecycle.[102]

> *'Cutting carbon cannot be a 'top down' approach; it requires the buy-in of everyone whose mindset, commitment and actions are vital to achieving a step change. One way we did this was to make our local businesses take responsibility for their own emissions and pay to offset the carbon they emitted each year'.* **Willmott Dixon**[103]

The Playbook mandates the use of *'early supply chain involvement'* ('*ESI* ') which *´extends the principle of early contractor involvement by formally engaging the tier 1 contractor alongside the tier 2 and 3 sub-contractors and suppliers in the pre-construction phase to input to the design (including the use of standards for products and interfaces), costing, risk management and structuring of a project or programme.'* [104] The Playbook states that *ESI 'will*

[101] *Construction Playbook*, p. 23.
[102] *Construction Playbook*, p. 68.
[103] https://www.willmottdixon.co.uk/news/willmott-dixon-targets-its-buildings-to-be-net-zero-carbon-in-use-by-2030
[104] *Construction Playbook*, p. 24.

facilitate innovative, cost-effective solutions ensuring there is a major focus on social value and sustainability.'[105]

The Playbook recognises how *ESI* enables a client to attract, test and adopt net zero carbon proposals when they have their greatest impact, as illustrated in **Figure 3**, and it requires that:

- *´Contracting authorities should require that solutions put forward by potential suppliers are accompanied by a whole life carbon assessment.*
- *This should be conducted in collaboration with the wider supply chain, reflecting ways of minimising the GHG emissions across the life of the asset.*
- *Whole life carbon assessments are expected to mature over time with higher-level assessments at the early engagement phase developing into robust assessments included in the final tender documentation.´*[106]

As regards any suggestion that a single stage approach is necessary because *ESI* extends project timescales, the Playbook states that the opposite is true and that *ESI* is *'key to reducing end-to-end programme timescales, identifying opportunity and mitigating risk early and accessing the industry experts' knowledge and experience in all tiers of the supply chain early in the project or programme lifecycle.'*[107]

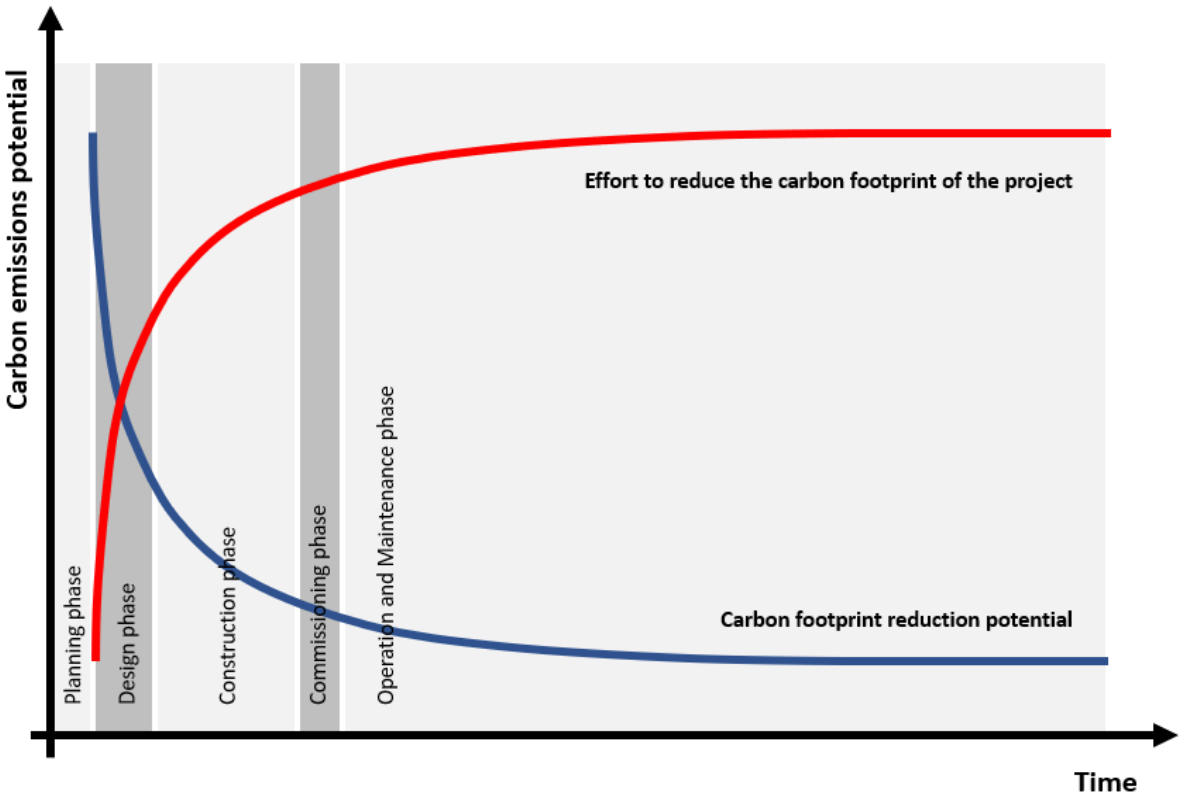

Figure 3: The impact of early net zero carbon proposals

ESI ensures that main contract and subcontract appointments are made early enough to secure the maximum net zero contributions from each team member, not by way of speculative

[105] *Construction Playbook*, p. 22.
[106] *Construction Playbook*, p. 23.
[107] *Construction Playbook*, p. 22.

optional extras but as important contributions to optimising project designs, sources of supply, methods of construction and other working practices. For example, *ESI* can enable the systematic joint analysis and validation of the net zero designs and specifications that each design consultant, contractor, subcontractor or supplier is being asked to warrant. Without this joint analysis and validation, a design warranty is not reliable.

By inviting *ESI* proposals from contractors and supply chain members and allowing an agreed period of time for them be assessed jointly, a project team can establish the full potential for significant reductions in environmental impact through:

- Agreeing the most buildable and least wasteful interpretation of consultant designs
- Agreeing ways to reduce waste and increase recycling
- Agreeing the most efficient use of energy on site, including through modern methods of construction such as off-site fabrication
- Agreeing the most efficient use of energy by reduced maintenance and repair in the operation of the built facility.[108]

ESI and protecting the environment: The Rye Harbour Trial Project comprised the £9.6 million replacement of a harbour wall as part of the Environment Agency's flood defence programme, by a team comprising Waterways / Environment Agency (client), Jackson Civil Engineering (main contractor), Halcrow, EC Harris (project manager), Arcadis (cost consultant), Arcelor Mittal (steel sheet pile supplier), Team Van Oord in partnership with Jackson's (civil engineering) and Commercial Marine and Piling (subcontractor).
The Environment Agency adopted ESI and collaborative relationship management, including co-location, which enabled them to generate agreed savings of 6% , to manage a tight timeframe and to create a range of improved environmental value including:

- Precious intertidal plants from the salt marsh being transplanted, avoiding loss of vegetation
- Close working with marine ecology teams preventing any lost mudflats from damaging the environment and saving money in waste disposal
- vibro-piling innovation which reduced noise on site so that birds were not disturbed and so that the team could work through the bird breeding season.[109]

ESI and net zero carbon: Improved net zero results were delivered by collaborative procurement and contractual techniques on the £30 million Hackney Academy in London which used ESI to focus on improved sustainability. The project outcomes included a ground source heat pump and photovoltaic panels and the team reported:

- '*a strong partnering ethos through client leadership … by the City of London Corporation, supporting the team in meeting significant time and cost challenges'*
- *'maximum engagement with stakeholders, including staff and pupils, at all stages of the project'*

[108] *Collaborative Construction Procurement and Improved Value*, p.298.
[109] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/248614/Procurement_Trial_Project_Case_Study_EA_Rye_Harbour_0_2.pdf

- *'collective team contributions to sustainability improvements, with maximum use of natural light and energy-saving techniques.'*[110]

ESI contracts should be entered into at a time when they can support the early planning of projects and programmes of work and when they can help to reduce the risk of unforeseen events by fully integrating the work of team members. To coordinate and motivate the work of team members, *ESI* contract terms should govern the timing and procedures for design development, supply chain appointments and other joint planning activities. The Construction Playbook is neutral as to the choice of contract forms that enable *ESI*, but it warns against the use of separate preconstruction phase agreements because the *'procurement process, evaluation approach and contract should generally be structured to cover both the ESI and the construction phase. While it is possible to follow ESI with a further competitive procurement process, this can undermine the benefits of using ESI.'*[111]

The UK government recommends the following procurement models which have been proven through a series of *Trial Projects*[112] to achieve improved efficiencies by using collaborative *ESI* systems and in some cases building information modelling (*BIM*):

- '*Two Stage Open Book'*, comprising the pre-construction phase conditional appointment of team members as a means to develop early collaboration and to encourage proposals for cost savings and improved value, within a stated budget, prior to confirming construction phase appointments[113]
- '*Cost Led Procurement'*, comprising the use of a framework mini-competition as a means to encourage speculative proposals for savings and improved value, within a stated cost ceiling, prior to making team appointments[114]
- '*Integrated Project Insurance' ('IPI')* comprising appointment at outset of an alliance team to develop a delivery solution within a target budget and a collective commitment to achieve the required outcomes, supported by a client-funded, non-recourse insurance policy covering latent defects and cost overruns[115].

A systematic *ESI* approach to obtaining, examining and agreeing supplier net zero solutions is set out in the *Two Stage Open Book* techniques whereby:

- *'At the point of selection of the Consultants and Tier 1 Contractor, Two Stage Open Book provides the basis for a transparent competitive process in respect of their fees/profit/overheads, and any other components of the project for which it is*

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[110] *10 Years of Partnering Contracts*, Association of Consultant Architects (2010), https://docplayer.net/3582408-Association-of-consultant-architects-1o-years-of-partnering-contracts-ppc2000-tpc2005.html p. 20: '*The project won the Excellence in Building Schools for the Future Award 2009 for 'Innovation and Student Engagement'*. The pupils described it as '*the best school ever',* and it also won the Constructing Excellence 2010 London and South-East Award for '*Integration and Collaborative Working.'*

[111] *Construction Playbook*, p.24. Separate preconstruction phase agreements that are vulnerable to this criticism include the *JCT2016* Pre-Construction Service Agreement.

[112] file:///C:/Users/K1217231/AppData/Local/Temp/Trial-Projects-Working-Group-final-report-2017.pdf

[113] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325014/Two_Stage_Open_Book_Guidance.pdf.

[114] file:///C:/Users/K1217231/AppData/Local/Temp/Cost_Led_Procurement_Guidance.pdf

[115] file:///C:/Users/K1217231/AppData/Local/Temp/20140702_IPI_Guidance_3_July_2014.pdf

appropriate to test costing, such as risk contingencies and the provisional cost of particular proposals submitted.

- *Evaluation of fees/profit/overheads and such other costs needs to be balanced appropriately against evaluation of qualitative proposals and the proven ability of the Consultants and Tier 1 Contractor to deliver the project/programme within the Project Budget cost ceiling*
- *At the point of selection of Tier 2/3 Subcontractors and Suppliers, Two Stage Open Book provides the basis for further transparent competition based on accurate costing and additional qualitative proposals.* '[116]

ESI enables the cost and quality benefits of net zero carbon proposals to be thoroughly developed and assessed by the members of a team, thereby providing the client with the means to evaluate the cost of environmental issues and to balance this against their demonstrable benefits. *ESI* also provides a means for the client, consultants and tier 1 contractor to work collaboratively with tier 2 and 3 supply chain members that include *SMEs*. The omission of *SMEs* from *ESI* contributions can result in significant missed opportunities for clients because '*SMEs are experts in their fields and can provide insight into MMC, innovative technologies and ways to minimise the GHG footprint of the proposed solutions across their whole lifecycle'*.[117]

6 Long-term contracts and industry investment

The construction procurement strategy, team selection processes and construction contracts should make clear how long-term contracts will be awarded for pipelines of work that will attract industry investments in net zero carbon through innovations such as offsite manufacture.

Modern methods of construction ('*MMC*') encompass off-site, near site and on-site pre-manufacturing and have the potential to speed up delivery, reduce cost, improve quality, reduce waste and reduce carbon emissions.[118]. A range of *MMC* approaches is illustrated in **Figure 4** and the House of Lords Science and Technology Select Committee reported that the benefits of *MMC* include:

- *'Better quality*
- *Enhanced client experience*
- *Fewer labourers and increased productivity*
- *More regional jobs away from large conurbations*
- *Improved health and safety for workers*
- *Ensure buildings meet quality assurance standards*
- *Improved sustainability*

[116] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325014/Two_Stage_Open_Book_Guidance.pdf
[117] *Construction Playbook*, p. 23.
[118] *Construction industry must harness Covid spirit and MMC to reach net zero*, Brayshaw, V. https://www.newcivilengineer.com/innovative-thinking/construction-industry-must-harness-covid-spirit-and-mmc-to-reach-net-zero-16-06-2021/

- *Reduced disruption to the local community during construction.*'[119]

The Construction Playbook emphasises how *MMC* '*can deliver efficiencies and higher quality and safer solutions with lower GHG emissions quicker than traditional construction methods.*'[120] It emphasises the potential of *MMC* and *'product platforms comprising of standardised and interoperable components and assemblies.* '[121] The Playbook requires clients to collaborate in finding opportunities for cross-sector platform solutions and it states that *'procurements and frameworks should support this'*.[122] It also recognises the potential for *'greener solutions as a result of an increase in manufacturing approaches'*.[123]

The Playbook states that:

- '*We need to change the way we procure construction to support investment in MMC and skills*
- *Adopting longer term contracting is one way of achieving this, but however we contract across our portfolios of public works, we need to actively consider how we can maximise the use of MMC.*
- *Contracting authorities should develop a comprehensive strategy at an organisational level.*
- *This should run through their portfolios and down to individual projects and programmes.*
- *MMC is not an end in itself and contracting authorities should consider whether, how and to what extent the use of MMC can drive wider value and achieve the project or programme outcomes.* '[124]

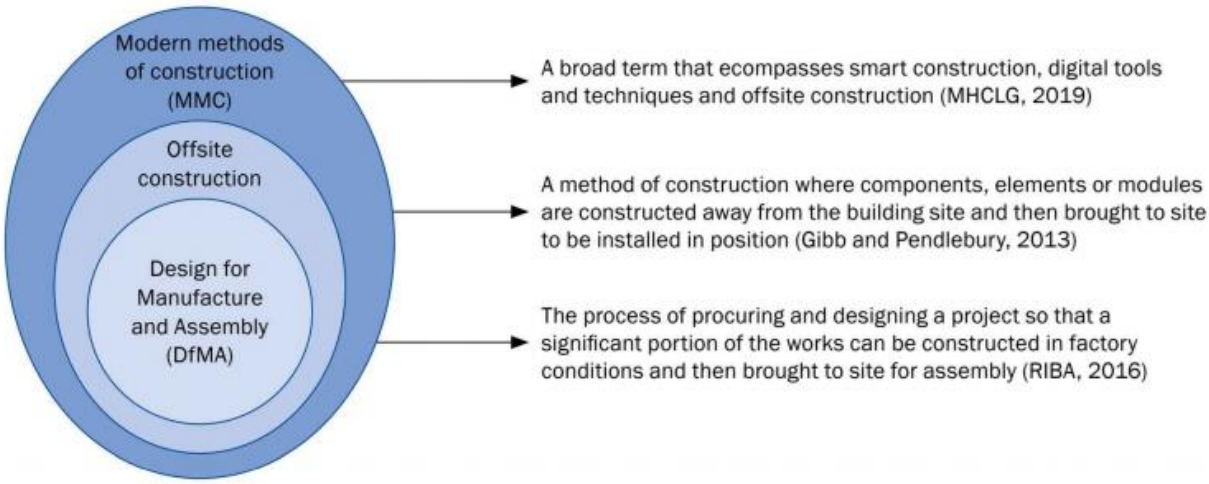

Figure 4: Range of approaches to MMC[125]

[119] *Offsite manufacture for construction: Building for Change*, House of Lords Science and Technology Select Committee, https://publications.parliament.uk/pa/ld201719/ldselect/ldsctech/169/169.pdf
[120] *Construction Playbook*, p.18.
[121] Construction *Playbook*, p.21.
[122] *Construction Playbook* p.20.
[123] *Construction Playbook*, p.19.
[124] *Construction Playbook*, p.18.
[125] *Methodology for quantifying the benefits of offsite construction*, Janson Van Vuuren, T., Middleton, C., 2020, C792, CIRIA, London, UK (ISBN: 978-0-86017-897-2) www.ciria.org

The 2005 National Audit Office Report '*Using Modern methods of construction to build homes more quickly and efficiently*' presented a case for *MMC* which resonates with reduction of the construction carbon footprint, stating that it should be possible to build up to four times as many homes with the same on-site labour and that on-site construction time can be reduced by over 50%. [126]

> *'While Balfour Beatty has made reducing the amount of work we undertake onsite a core part of its strategy, and others on the supply side are following suit, there are those in the industry itself who are not yet investing in innovative approaches. They are held back by the significant upfront investment needed (in a low margin sector) and the limited profitability of offsite while the market for it remains narrow. Something needs to be done to incentivise the sector to create capacity now for when it is needed'.* **Balfour Beatty**[127]

If carbon impact relating to the production and construction stages of a built asset can account for half of a new building's whole life carbon impact[128], then the direct CO2 emissions highlighted in **Figure 5** can be significantly reduced by moving away from traditional site-based construction towards the adoption of *MMC*. Savills forecast that the percentage of new built homes using *MMC* will rise from 8% in 2020 to 20% by 2030, and they report that the factors driving adoption of *MMC* include the cost and availability of labour, housing supply shortages and regulatory or governmental intervention. [129]

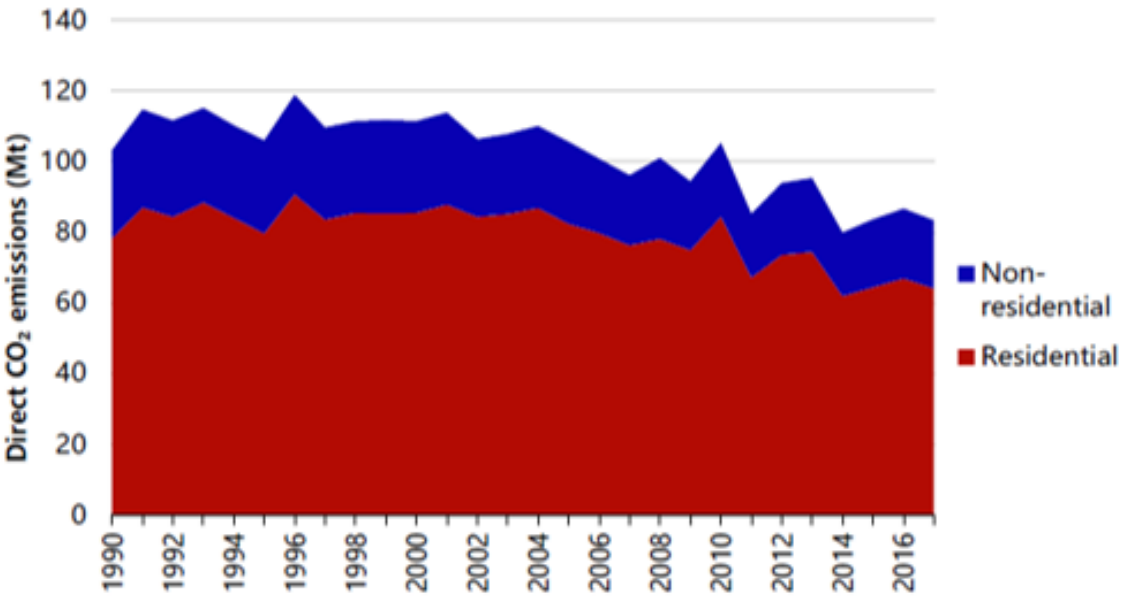

Figure 5: Building Sector direct CO2 emissions[130]

[126] National Audit Office 2005 https://www.nao.org.uk/wp-content/uploads/2005/11/mmc.pdf
[127] https://www.balfourbeatty.com/media/317714/streamlined-construction-seven-steps-to-offsite-and-modular-building.pdf.
[128] UK GBC report April 2019 https://www.ukgbc.org/ukgbc-work/net-zero-carbon-buildings-a-framework-definition/
[129] *Spotlight: Modern Methods of Construction*, Savills 2020 , https://www.savills.co.uk/research_articles/229130/301059-0/spotlight--modern-methods-of-construction
[130] Committee on Climate Change, May 2019 http://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf

Modern methods of construction offer efficient means to reduce carbon emissions[131] but their adoption depends on procurement strategies that support *MMC* technologies by rewarding supplier investments in research and production facilities. The Construction Playbook states that *´Projects and programmes should engage in innovative thinking from the start through early engagement. Research and innovation-based procedures which go beyond engagement to inviting the market to suggest novel solutions to problems should also be considered.´*[132]

The innovations and efficiencies through which *MMC* can reduce carbon emissions depend on the strength and stability of the relationships that clients and suppliers create. King's College London Centre of Construction Law was commissioned by the UK Construction Industry Council to undertake research into long-term strategic relationships designed to support the use of *MMC* for the procurement of housing.[133] Research outputs reinforced the need for these long-term relationships to be embedded in contracts which integrate design, construction and operation and which stimulate *'new sustainability initiatives'* linked to:

- Consortium procurement by multiple housing clients Supply chain initiatives for offsite and modular construction
- Early contractor involvement and supply chain collaboration
- Delivery of social value through strategic procurement including local/regional/*SME* tier 1/2/3 supply chain opportunities and employment/skills commitments
- Performance/innovation to improve driven by value and key performance indicators
- Behaviours which build relationships, and which create a working environment to deliver innovation, investment in capacity, improved quality and reduced cost
- Long-term strategic partnerships in housing procurement programmes.[134]

Modular construction, offsite fabrication and other *MMC* solutions depend on factory production lines, and these in turn require long-term contractual commitments. The Construction Playbook recognises that portfolios and longer-term contracting '*will give the industry the certainty required and make it commercially viable for suppliers to invest in innovative new technologies and MMC'*, provided that this *'does not come at the expense of an innovative and competitive market'*.[135]

A robust competitive process based on the recommendations in Section 7 of this report should draw out the full benefits of *MMC* proposals and should enable investment in these proposals through a long-term contract such as a '*framework alliance contract'* as considered in Section 9 or through a '*term call-off contract'* as considered below.

Term call-off contracts are widely used in the construction sector as a means to issue multiple works orders under a single contract.[136] However, in order to deliver improvements in environmental value and to reconcile these improvements with other measures of value, risk

[131] *Benefits of Modern Methods of Construction*, Whiteman, S., https://www.fgould.com/uk-europe/articles/benefits-of-modern-methods-of-construction/
[132] *Construction Playbook*, p. 23.
[133] *'Research Report and Draft Model Forms for Long-Term Strategic Relationships for CLC Innovation in Buildings Workstream'* (2018) https://www.kcl.ac.uk/construction-law/activity
[134] https://www.kcl.ac.uk/construction-law/activity
[135] *Construction Playbook*, p.11.
[136] Standard form *term call-off contracts* include the *ICC 2011* Term Version, the *JCT 2016* Measured Term Contract and the *NEC4* Term Service Contract. There is currently no *FIDIC term call-off contract.*

and industry profitability, *term call-off contracts* should also have '*alliance*' features through which they provide for:

- Analysis, agreement and adoption of industry net zero carbon proposals as considered in Section 4[137]
- *ESI* and *Supply Chain Collaboration* as considered in Sections 5 and 7[138]
- Contract governance and joint risk management as considered in Section 8[139]
- Shared objectives, success measures, targets and incentives as considered in Section 9[140]
- Whole life procurement and digital information as considered in Section 10[141]
- Action plans and leadership as considered in Section 11.[142]

The September 2020 report *'Build Homes, Build Jobs, Build Innovation – A Blueprint for a Housing Industrial Strategy'* recognises the value of long-term contractual commitments under the '*TAC-1*' term alliance contract[143] and describes how this form was adopted for *MMC* procurement by the Royal Borough of Greenwich and Ideal Modular[144]. The *TAC-1* term alliance contract, and its predecessor the *TPC2005* term partnering contract, are long-term collaborative *term call-off contracts* through which numerous public sector and private sector clients and teams have delivered improved environmental value using *MMC* .[145]

In addition, if consistent throughput for *MMC* production facilities depends on the aggregation of a portfolio of projects by multiple clients, then a multi-client '*framework alliance contract'*, as considered in Section 9, provides the procurement and contractual machinery to achieve this. *Build Homes, Build Jobs, Build Innovation* explained how *'more innovative and progressive contracts reflect earlier and closer engagement with manufacturers, for instance the ACA Framework Alliance Contract (FAC 1) for long-term strategic relationships enabling one or more clients to integrate housing programmes that are delivered through smart construction linked to separate design, construction and operation contracts.*'[146]

[137] For example, *TAC-1* Term Alliance Contract clauses 1,10 and 11 and Schedule 8 Part 2.
[138] For example, *TAC-1* Term Alliance Contract clause 6 and Schedule 2.
[139] For example, *TAC-1* Term Alliance Contract clauses 1 and 9 and Schedule 3.
[140] For example, *TAC-1* Term Alliance Contract clause 2 and Schedules 1 and 2.
[141] For example, *TAC-1* Term Alliance Contract Schedule 7.
[142] For example, *TAC-1* Term Alliance Contract clauses 2 and 3.
[143] *TAC-1* Term Alliance Contract, 2016, Association of Consultant Architects, https://allianceforms.co.uk/
[144] *Build Homes, Build Jobs, Build Innovation*, p. 34.
[145] https://allianceforms.co.uk/ , News and Users.
[146] *Build Homes, Build Jobs, Build Innovation*, September 2020, p. 34 De'Ath, M and Farmer, M https://www.hta.co.uk/storage/app/media/build-homes-build-jobs-build-innovation.pdf

7 Specialists and supply chain collaboration

Clients, consultants and contractors should commit to contractual systems by which they explore systematically the best ways for specialist supply chain members to contribute their net zero carbon expertise and the best ways for local and regional supply chain members to offer a lower carbon footprint.

'Supply Chain Collaboration' is a strategic approach to *ESI* through which one or more clients and one or more tier 1 consultants and/or tier 1 contractors together undertake a sequence of agreed supply chain engagement activities in accordance with a shared timetable[147]. *Supply Chain Collaboration* can ensure that tier 1 consultants and tier 1 contractors take account of the particular benefits that tier 2/3 supply chain members offer in terms of cost, quality and net zero carbon targets.[148] The structure of *Supply Chain Collaboration* is illustrated in **Figure 6**.

Supply Chain Collaboration enables the cost and quality benefits of net zero carbon proposals to be developed thoroughly and to be assessed by all team members. As noted by Housing Forum in '*Stopping Building Failures'*, this gives clients '*the means to evaluate the cost of environmental issues …and to balance this against their demonstrable benefits*'.[149] On several UK *Trial Projects*, the new lines of communication and the additional time created for joint working through *Supply Chain Collaboration* led to team members offering innovative sustainable solutions combined with extended warranties and agreed cost savings. [150]

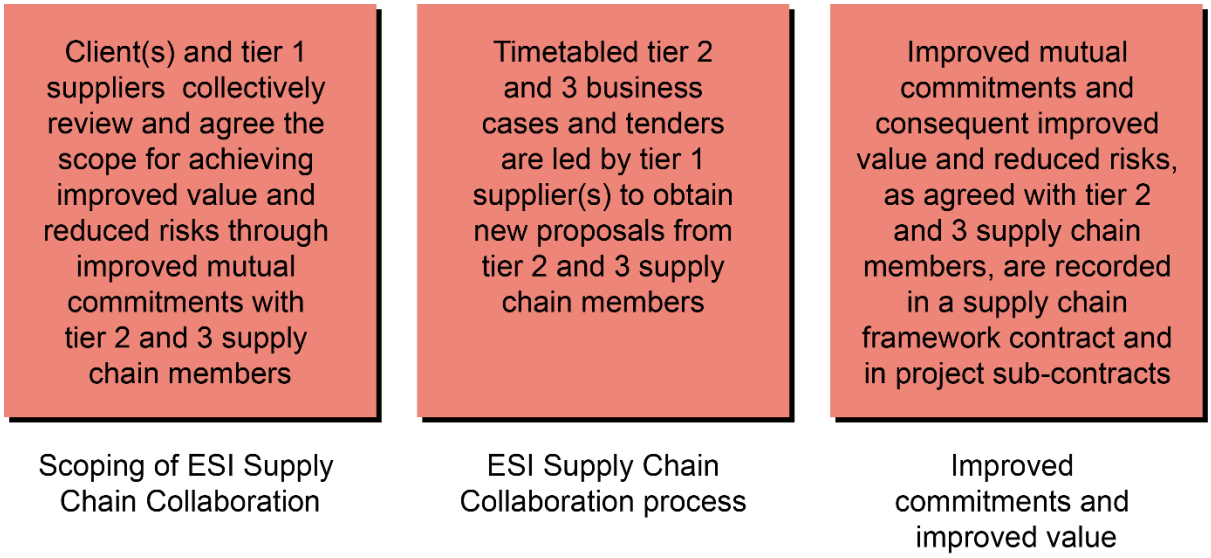

Figure 6: Structure of Supply Chain Collaboration[151]

Decarbonization of the supply chain is fundamental to tackling climate change, and '*Net-Zero Challenge: The supply chain opportunity'* recognises that:

[147] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325014/Two_Stage_Open_Book_Guidance.pdf.
[148] *Constructing the Gold Standard*, p. 59.
[149] https://housingforum.org.uk/reports/quality-and-standards/stopping-building-failures/
[150] file:///C:/Users/K1217231/AppData/Local/Temp/Trial-Projects-Working-Group-final-report-2017.pdf
[151] *Constructing the Gold Standard*, p.59.

- *´…beyond defining procurement standards, supply chain emission reductions often require more intensive supplier collaboration – to educate suppliers about decarbonization levers, provide technical advice, enable longer-term asset upgrades and cultivate continuous improvement´*
- *´…setting procurement standards for suppliers is one of the most powerful direct levers to address upstream emissions*
- *'Strong standards link practices – such as a specific share and quality of renewable power, required levels of process efficiency or a required share of recycled materials – to procurement decisions´.*[152]

Supply-chain decarbonization will be a 'game changer' for the impact of corporate climate action. Addressing Scope 3 emissions is fundamental for companies to realize credible climate change commitments. Nigel Topping, **UNFCCC High-Level Climate Action Champion**[153]

Trial Projects have shown how *Supply Chain Collaboration* enables environmental initiatives to be combined with support for *SME* businesses, particularly where the scale of the programme enables consistent procurement practices and where collaborative systems facilitate exchanges of ideas. *Supply Chain Collaboration* can ensure that tier 1 suppliers take account of the particular net zero benefits that local and regional supply chain members offer. For example, in addition to efficiencies based on their specialist knowledge and experience, local or regional companies use less energy in travelling shorter distances to construction sites.

Supply Chain Collaboration and SMEs: Hackney Homes and Homes for Haringey (together SCMG) created a multi-client, multi-contractor framework alliance to deliver their £240 million housing improvement programme, agreeing action plans with Mulalley, Keepmoat, Mansell, Lakehouse, Lovell and Wates, and with a wide range of tier 2 and 3 *SME* supply chain members (covering 30 different disciplines) under standardised *Supply Chain Collaboration* systems for joint planning, design, costing and risk management. [154] . Through these systems the SCMG clients and tier 1 contractors worked with local *SMEs* and national manufacturers including Veka, Bauder, Sovereign and Birchcroft as integrated teams who, together, delivered agreed cost savings and social value combined with extended warranties and more sustainable solutions across the framework portfolio. Improved environmental value included:

- '*future-proofing green roofs at no additional cost and upgrading windows from Grade C to Grade A at no additional cost.*'
- '*improved repairs and maintenance through, for example, self-cleaning glass on high rise blocks'* and '*more sustainable solutions including external wall insulation.*'[155]

[152] *Net-Zero Challenge: The supply chain opportunity*, p. 30.
[153] https://www.bcg.com/press/21january2021-supply-chain-decarbonization-offers-a-game-changing-opportunity-to-fight-climate-change.
[154] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325951/SCMG_Trial_Projects_Case_Study__CE_format__130614.pdf
See also https://housingforum.org.uk/reports/quality-and-standards/stopping-building-failures/
[155] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325951/SCMG_Trial_Projects_Case_Study__CE_format__130614.pdf

The *FAC-1* framework alliance contract[156] and the *TAC-1* term alliance contract[157] both describe *Supply Chain Collaboration* as one of the collaborative systems through which all parties commit *'to reduce carbon emissions, to reduce use of energy and or natural and manmade resources, to improve waste management'* [158] and to take other agreed measures to protect or improve the condition of the environment. These standard contract forms provide for the scoping and implementation of *ESI* at a strategic level and set out a clear sequence of *Supply Chain Collaboration* activities in accordance with a shared '*Timetable*' through which alliance members:

- Review and compare the value offered by supply chain members
- Review the potential for more consistent, longer term, larger scale supply chain contracts and for other improved commitments and supply chain working practices
- Jointly renegotiate or retender supply chain contracts
- Agree more consistent, longer term, larger scale supply chain contracts and other improved supply chain commitments and working practices.[159]

Supply Chain Collaboration and whole life asset management: Surrey County Council procured a *TPC2005* term alliance contract with Kier and supply chain members Aggregate Industries and Marshall Surfacing to create an integrated team for a five year £100m highways asset management programme. Adopting *ESI* through *Supply Chain Collaboration* created a culture of collaborative working at all levels of the supply chain and led to agreed savings in excess of 12% sustained over a period of five years combined with qualitative benefits that included:

- Innovation through collaborative working, for example to increase recycling and reduce landfill
- Improved quality control through joint risk assessments, agreement of appropriate surface treatments and joint monitoring of work on site
- Lean programming of individual tasks leading to reduced time on site
- Improved whole life value, including a ten-year warranty for material and pavement design.

Analysis of work on site showed no major remedial work required, no major health and safety incidents and improvements to drainage systems and footways as part of the agreed design solutions. Surrey Highways received over 100 complimentary letters from residents and Council members, having never received any before.[160]

[156] https://allianceforms.co.uk/about-fac-1/
[157] https://allianceforms.co.uk/about-tac1/#:~:text=What%20is%20the%20TAC%2D1%20Term%20Alliance%20Contract%3F,value%20through%20building%20information%20modelling
[158] *FAC-1* Framework Alliance Contract Association of Consultant Architects, https://allianceforms.co.uk/ clause 6.3 and Appendix 1; *TAC-1* Term Alliance Contract clause 6.3 and Appendix 1.
[159] *FAC-1* Framework Alliance Contract clause 6.3 and *TAC-1* Term Alliance Contract clause 6.3.
[160] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325947/Project_Horizon_Surrey_Trial_Projects_Case_Study_130614.pdf

8 Contract governance and joint risk management

Clients should ensure that their construction contracts include a definition of sustainability that includes net zero carbon and describe systems of collaborative governance and joint risk management by which the client, consultants, contractors and supply chain members will work together and individually to achieve net zero carbon and other sustainable outcomes.

The Chancery Lane Project propose new clauses in standard form construction contracts covering '*Energy Efficiency and Environmental Obligations'*, '*Green Project Modifications'* and *'Green Design and Construction Standards*.'[161] However, collaborative contract forms can do more to ensure the adoption of these obligations because they offer a multi-party '*enterprise planning'* [162] system through which multiple team members can agree, integrate, coordinate and deliver activities designed to achieve net zero carbon targets. The UK Construction Industry Council recognised how an effective collaborative contract *'sets out the common and agreed rules; it helps define the goals and how to achieve them; it states the agreed mechanism for managing the risks and the rewards; it lays down the guidelines for resolving disputes.'*[163]

Contractual machinery should set out how reduced carbon emissions form part of the mutual obligations of the team members. The only standard form contracts that expressly provide for '*measures intended to reduce carbon emissions'* as part of an obligation to pursue improved '*Sustainability*' comprise the *FAC-1* framework alliance contract[164], the *TAC-1* term alliance contract[165] and the '*PPC2000'* project partnering contract.[166] These are all multi-party contract forms which create a consistent approach to net zero carbon agreed directly between all team members.

Without direct contractual relationships and mutual commitments, it is difficult for team members to integrate their working practices, to align their different commercial interests, to grant each other licences of intellectual property and to reconcile the rules of competition with the rules of collaboration. Two-party contracts are not visible to other parties and this lack of transparency can contribute to an atmosphere of mutual distrust which limits the sharing of experiences, ideas and innovations through which to improve environmental value and manage environmental risks.

The features of a collaborative term alliance contract are considered in Section 6 and the equivalent features of a collaborative framework alliance contract are considered in Section 9. Similarly, a single project collaborative construction contract should set out systems for:

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[161] https://chancerylaneproject.org/climate-clauses/ pp. 184,187,191.

[162] '*Enterprise planning'* and '*enterprise contracts'* are considered in SCL Paper 299, Mosey, D. and Jackson, S., *Good faith and relational contracting – do enterprise contracts offer a way through the woods?*

[163] *Guide to Project Team Partnering*, Construction Industry Council, 2012, p. 12.

[164] See Section 9 of this report and the *FAC-1* Framework Alliance Contract Appendix 1 and clause 2.2, which define '*Sustainability*' as including '*reduced carbon emissions'* and includes this within the obligation of all parties to investigate and submit for approval proposals to acheive '*Improved Value.'*

[165] See Section 6 of this report and the *TAC-1* Term Alliance Contract Appendix 1 and clause 2.2 which define '*Sustainability*' as including '*reduced carbon emissions'* and includes this within the obligation of all parties to investigate and submit for approval proposals for '*Improved Value.*

[166] The *PPC2000* Project Partnering Contract (amended 2013), Association of Consultant Architects, Appendix 1 defines '*Sustainability*' as including '*reduced carbon emissions'*, and the clause 4.2 '*Targets'* include '*improved Sustainability'* at clause 4.2 (ix).

- Analysis, agreement and adoption of industry net zero proposals as considered in Section 4[167]
- *ESI* and *Supply Chain Collaboration* as considered in Sections 5 and 7[168]
- Contract governance and joint risk management as considered in this Section 8[169]
- Shared net zero objectives, success measures, targets and incentives as considered in Section 9[170]
- Whole life procurement and digital information as considered in Section 10[171]
- Net zero action plans and leadership as considered in Section 11.[172]

Collaborative construction contracts should state the systems by which net zero proposals will be accepted and implemented at a strategic level and at a project level. They should link outcome-based specifications to the measurement of performance by reference to the achievement of net zero outcomes. They should also state how performance measurement will recognise and reward the achievement of required net zero outcomes, including who evaluates performance, how feedback is shared and how it is used. Outcomes should be objectively measurable and assessed openly by all parties because private measurement can be seen as subjective and can damage mutual trust between clients, consultants, contractors and supply chain members.[173]

'Stratford District Council, Wychavon District Council and Savills are leading a 'Social Housing Decarbonisation Demonstrator Programme' that complies with PAS2035 (Retrofitting dwellings for improved energy efficiency), integrating their work with Rooftop Housing Group, Citizen Housing Group, Trent and Dove Housing, the Trident Group and the Orbit Housing Group. They are using FAC-1 with PPC2000 to maximise efficiencies through:

- *Joint procurement and collaborative working to deliver shared best practice and innovation*
- *Early supply chain involvement to finalise surveys, designs, risks and costs*
- *Consistent systems of project management, tenant engagement and education'.* **Shane Hughes, Savills[174]**

Relationships can break down and value improvement opportunities can be missed if performance measures:

[167] For example, *PPC2000* clause 8.
[168] For example, *PPC2000* clauses 8, 10 and 12. *ESI* can also be implemented through the *JCT 2016* Pre-Construction Services Agreement and through *NEC4* Option X22.
[169] For example, *PPC2000* clauses 3 and 18 and Appendix 7.
[170] For example, *PPC2000* clause 4. The NEC are currently developing new provisions which aim '*to incentivise the NEC supply chain to meet the client's emissions and sustainability targets, and to link these into core processes of the contracts, such as early warnings, the programme and compensation events. In addition, contractors will be encouraged to propose changes to the scope that will reduce the climate-change impact of both the construction and operation of the client's asset*'. https://www.neccontract.com/About-NEC/News-and-Media/New-NEC-secondary-option-will-incentivise-net-zero-emissions
[171] For example, *PPC2000*) Appendix 10.
[172] For example, *PPC2000* clause 5.
[173] *Constructing the Gold Standard*, p. 62.
[174] http://allianceforms.co.uk News and Users.

- *'Are not outcome-based*
- *Are not applied transparently*
- *Are inconsistent or subjective*
- *Are used primarily to penalise suppliers rather than reward them*
- *Are not used as a basis to award further work*
- *Are not relevant to the client's required or desired outcomes*
- *Are not used for feedback to suppliers*
- *Are not used to drive continuous improvement.'*[175]

A collaborative contract should describe the joint risk management processes through which clients, consultants, contractors and supply chain members exchange information in relation to the environmental risks they face and decide what actions to take. Risks can be managed more efficiently by a collaborative team if they put shared contractual machinery in place, and the ISO 44001 international standard for collaborative business relationships states that *'an effective collaboration is one where the parties share responsibility as far as is practical in supporting the individual risk of the partners.'*[176]

Contractual machinery for the joint management of environmental risks includes:

- A contractual system for sharing risk information and agreeing risk management actions, enabling *'early risk work focused on achieving project strategic objectives and alignment'*[177]
- The use of *ESI* for *'exploring opportunities to develop solutions that help mitigate risk through joint working before construction commences'*[178]
- A contractual structure that connects the client, consultants, contractors and supply chain members through systems for *'sharing of appropriate risk registers and transparent communication on risk allocation with prospective suppliers and the supply chain'*[179]
- A multi-party *'joint register with contracted suppliers which is aligned to project and wider outcomes',* and which is managed and updated with agreed risk management actions and timescales. [180]

Construction projects and programmes may encounter environmental risks that cannot be fully assessed and dealt with in advance. The Playbook emphasises the need to *'apply a proactive risk management approach with suppliers incorporating early warning and joint decision-making.'* [181] A collaborative construction contract should include machinery for the proactive management of unexpected environmental risks using:

[175] *Constructing the Gold Standard*, p. 62.
[176] ISO 44001-2017 *Collaborative Business Relationship Management Systems - Requirements and Frameworks*.
[177] *Construction Playbook*, p.49.
[178] *Construction Playbook*, p.48.
[179] *Construction Playbook*, p.49.
[180] *Construction Playbook*, p.49.
[181] *Construction Playbook*, p.50.

- Interconnected contractual '*early warning'* systems at framework level and project level[182]
- A contractual '*core group*' or the equivalent comprising individuals representing the client, consultants, contractors and supply chain members who are required to manage risks collectively, who receive *early warnings* and who seek to agree risk mitigation actions.[183]

ISO 44001 recommends an equivalent system for joint issue resolution that:

- *'Defines a decision-making hierarchy*
- *Identifies and resolves issues at the earliest practicable opportunity*
- *Assigns importance, priority and/or timeframe, and responsibility for resolution at the optimum level*
- *Tracks the status of the issue: e.g. open, investigating, escalated, resolved*
- *Aligns with any agreement and/or contracting approach and integrated with lessons learned.*'[184]

The Construction Playbook states that *'one of the most effective ways to deliver outcomes is to create sustainable contracting environments that promote collaboration and reduce waste.'*[185] An environment that promotes collaboration and reduces waste needs to be cultivated and sustained by a fully functioning system of collaborative relationship management. The Playbook emphasises the value of investing in and maintaining collaborative relationships, and it states that:

- *'Acting together with suppliers drives mutual understanding and helps to solve problems more effectively, leading to better and faster delivery'*
- *'Strategic supplier relationship management can unlock additional value and innovation'*
- *'Contracting authorities should place significant importance on the relationships they create with their supply chains at an organisational and portfolio-level.*'[186]

Collaborative relationship management and lifecycle designs: Connect Plus created and implemented an innovative '*Sustainable Business Culture Model*' through which it created integrated teams, delivering a highways asset management programme in an efficient and collaborative manner under *Two Stage Open Book*[187] within a 30-year concession awarded by the Highways Agency (now Highways England). Their '*Balanced Scorecard'* approach enabled Connect Plus to understand and measure progress towards its declared objectives of:

[182] For example, *NEC4* clause 15, *PPC2000* clauses 3.7 and 27.3, *FAC-1* Framework Alliance Contract clause 1.8 and *TAC-1* Term Alliance Contract clause 1.8.
[183] For example, *NEC4* Option X12.3, clause *PPC2000* clauses 3.3 to 3.6, *FAC-1* Framework Alliance Contract clauses 1.6 and 1.7 and *TAC-1* Term Alliance Contract clauses 1.6 and 1.7.
[184] ISO 44001-2017 *Collaborative Business Relationship Management Systems - Requirements and Frameworks*, p.26 clause 8.6.8.
[185] *Construction Playbook*, p.40.
[186] *Construction Playbook*, p.64.
[187] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325014/Two_Stage_Open_Book_Guidance.pdf

- Delivering a whole life approach
- Minimising the impact of maintenance works
- Respect for the environment.

This project combined *Supply Chain Collaboration* with cultural change to align and integrate the client with the first, second and third-tier supply chain members, which enabled transparency, innovation and joint risk management. Connect Plus reported how '*improvements to the design were identified that reduced whole life costs and improved the long-term reliability of the works. Such improvements included rationalisation of bolt sizes, improvements to the noise-damping systems and additional packing to base plates*.'[188]

Collaborative relationship management should reach beyond the clients, consultants and tier 1 contractors to also include tier 2 and 3 supplier chain members. It also depends on the project managers and programme managers, whether client officers or independent consultants, exercising their judgment fairly and constructively when leading and coordinating:

- Outcome-based net zero strategies, procurement, contracting and incentivisation
- Environmental value improvement and risk management processes at strategic and project levels
- Consistent, proportionate and relevant performance measurement
- Collaborative decision-making and dispute avoidance.

For example, *PPC2000* requires the project manager[189] to exercise '*any discretion fairly and constructively, and facilitating an integrated design, supply and construction process'* when organising and monitoring the contributions of team members to:

- '*Value Management'*, which is defined as *'a flexible but structured approach aimed at achieving a solution that meets the Client's needs while achieving best value'*
- '*Risk Management'*, which is defined as '*a flexible but structured approach to ensure that risks are identified at the inception of the Project, that their potential impacts are allowed for and that where possible such risks or their impacts are minimised.'*[190]

Effective management of net zero carbon commitments includes decision-making processes that require collaborative skills in order to draw clients and suppliers together, motivate their joint working and help them to integrate their different commercial interests. Management should be supported by a contractual decision-making process that gives appropriate collective authority to clients, managers and suppliers through a forum such as the *core group*. In order to build consensus through a *core group*, a manager should act as an *'integrator'* who helps clients, consultants, contractors and supply chain members to:

- Integrate the net zero objectives and commitments of multiple parties
- Integrate the agreed net zero proposals and commitments of multiple parties
- Integrate participation in joint value improvement and risk management activities
- Integrate consistent approaches to the delivery of projects and programmes of work

[188] file:///C:/Users/K1217231/AppData/Local/Temp/Trial-Projects-Connect-Plus-Case-Study_Final.pdf
[189] Defined as the *'Client Representative'* in *PPC2000* Appendix 1.
[190] *PPC2000* clause 5.1 and Appendix 1.

- Integrate consistent and transparent performance measurement based on achieving agreed net zero outcomes and value improvements. [191]

Collaborative approaches to procurement and contracting can also benefit from experienced professional advice if it is available to all team members. Some collaborative contract forms include provision for the role of an '*Independent Adviser to provide impartial and constructive advice and support the Core Group'*.[192]Advice and support can also be provided by a '*team coach'* to encourage consensus-building and decision-making when seeking and adopting net zero solutions, and to help explore lessons learned from other industries.[193]

9 Framework alliances and shared learning

Clients, consultants, contractors and supply chain members should create multi-party 'Gold Standard' framework alliances through which to integrate the net zero carbon commitments of multiple parties on multiple projects and through which to share learning while protecting intellectual property rights and other confidential information.

Successful long-term strategic relationships require the support of procurement processes and contracts that are structured to retain and reuse agreed solutions and efficiencies that achieve improved environmental value. Frameworks can provide a proven long-term medium for optimising net zero commitments agreed between clients, consultants, contractors and supply chain members, enabling them to build successful relationships, to share ideas and to benefit from strategic relationship management.[194] For example, '*frameworks can support a strategic approach to rapid and safe implementation of the retrofit programmes for existing housing and other public buildings that are essential to achieving our net zero targets´*.[195]

> *'Through our example and our sharing of expertise, we hope to bring our clients and supply chain with us on a journey that will result in a quantifiable and transparent contribution to the reduction of carbon in the built environment, leaving a climate- positive legacy on all assets.'* **Morgan Sindall**[196]

The Construction Playbook describes how longer-term contracts should enable '*project and programme teams to identify potential opportunities and limitations in the market, take advantage of emerging technologies and innovations, and consider what actions would increase competition and improve market health.* '[197] Frameworks attract industry innovations in relation to net zero carbon if the framework providers and clients have a vision that is clear and persuasive, and if they offer the motivation of a sustainable pipeline of work. [198] If they

[191] *Constructing the Gold Standard*, p. 34.
[192] *FAC-1* Framework Alliance Contract clause 3.3 and *TAC-1* Term Alliance Contract clause 3.3.
[193] As described in, for example, *Guidance on Collaborative Procurement for Design and Construction to Support Building Safety* Section 12.
[194] *Constructing the Gold Standard*, p. 88.
[195] *Constructing the Gold Standard*, p.20.
[196] https://www.edie.net/news/6/Morgan-Sindall-outlines-fresh-carbon-accounting-and-engagement-moves-on-road-to-net-zero/
[197] *Construction Playbook*, p.10.
[198] *Constructing the Gold Standard*, pp.40,41.

create a credible pipeline of work, frameworks provide opportunities for clients to seek innovative industry proposals for net zero carbon at several points in the procurement process:

- When consultants, contractors and operators are seeking a place on the framework
- When consultants, contractors, manufacturers and operators are seeking appointment to a specific project or programme of work
- When consultants, contractors and operators are working collaboratively with clients and other consultants, contractors and operators, and also with tier 2 and 3 supply chain members, for the benefit of the framework as a whole.[199]

Frameworks can enable the net zero carbon commitments of individual organisations to be integrated into coherent strategic plans. They provide systems for net zero carbon proposals and other sustainability initiatives to be carefully evaluated at a strategic level and then to be adopted consistently on successive projects.

Constructing West Midlands and **North-West Construction Hub** report that they are *'working with the Cambridge Centre for Smart Infrastructure & Construction in developing and piloting a challenging national construction industry carbon reduction code under the headings of:*

- ***Water -*** *To minimise and reduce potable water usage in construction and operational use.; consider embodied water in the manufacture of materials, works and services*
- ***Waste*** *- To minimise waste by reducing, reusing, recycling and recovering in the built environment, throughout the construction phase and across the supply chain; consider a circular economy approach diverting waste from landfill*
- ***Materials*** *- To identify, source and use environmentally and socially responsible materials; consider health and safety requirements and other ways to promote well-being for construction workers and future building-users such as eliminating hazardous materials*
- ***Biodiversity and ecology*** *- To protect and improve flora, fauna and habitat and provide ecological benefits throughout the project lifecycle*
- ***Land, air, water, noise -*** *To maximise positive, and minimise negative effects on land, air, water, noise, throughout the construction delivery phase and to provide a lasting legacy*
- ***Supporting communities*** *- To consider the environmental impact on the community, and to get involved with and establish how a project can provide benefits and improve the area*
- ***Transport and mobility*** *- To consider opportunities for sustainable transport of labour and materials throughout the construction delivery phase and to consider opportunities to prioritise walking, cycling and public transport usage*

[199] *Constructing the Gold Standard*, p.61.

- ***Climate change mitigation and adaption*** *- To minimise greenhouse gases emitted in the built environment, the construction process and in the manufacture/delivery of associated goods, works, services; consider and maintain flexibility in design and construction processes and delivery methodologies to cater for future climate change adaption; reduce operational energy demand (before offsetting); reduce embodied carbon (before offsetting).* '[200]

Framework contracts can convert net zero carbon objectives into actions by creating new lines of communication, new commitments and clear timescales for clients and industry to agree sustainable solutions that are practical and affordable. Through strategic collaboration among framework providers, clients, managers, consultants, contractors and supply chain members, the proposals designed to achieve net zero carbon targets and other sustainability initiatives can be assessed and costed objectively for adoption on multiple framework projects. Frameworks also support joint net zero carbon initiatives by enabling shared access to *ESI* and *Supply Chain Collaboration* so that these collaborative framework systems are used to facilitate the exchange of ideas deriving from *BIM*, *MMC* and *SME* expertise.

Framework contracts are extensively used in the UK and a range of standard forms are available[201]. However, in order for a framework contract to deliver the improvements in environmental value that are necessary to achieve net zero targets, and in order to reconcile these improvements with other measures of value and industry profitability, framework contracts should include '*alliance*' features that provide expressly for:

- Analysis, agreement and adoption of industry proposals as considered in Section 4[202]
- *ESI* and *Supply Chain Collaboration* as considered in Sections 5 and 7[203]
- Contract governance and joint risk management as considered in Section 8[204]
- Shared objectives, success measures, targets and incentives as considered in this Section 9[205]
- Whole life procurement and digital information as considered in Section 10[206]
- Action plans and leadership as considered in Section 11.[207]

Alliance features appear in a range of bespoke framework contracts, but the use of bespoke forms causes its own inefficiencies because they lack consistency and give rise to additional procurement costs and potential confusion for clients and industry.[208] The only current standard form of framework alliance contract is *FAC-1* which was published in 2016 and which by 2022

[200] *Constructing the Gold Standard*, p. 21.
[201] For example, the *JCT2016* Framework Agreement and the *NEC4* Framework Contract. However, the limitations of these standard forms led to development of the *FAC-1* Framework Alliance Contract, designed for use in conjunction with contract forms governing individual projects such as the *FIDIC*, *JCT2016* and *NEC4* suites.
[202] For example, *FAC-1* Framework Alliance Contract clauses 1, 5, 10 and 11 and Schedule 4.
[203] For example, *FAC-1* Framework Alliance Contract clause 6 and Schedule 2.
[204] For example, *FAC-1* Framework Alliance Contract clauses 1 and 9 and Schedule 3.
[205] For example, *FAC-1* Framework Alliance Contract clause 2 and Schedules 1 and 2.
[206] For example, *FAC-1* Framework Alliance Contract Schedules 4 and 5.
[207] For example, *FAC-1* Framework Alliance Contract clauses 2 and 3.
[208] *Constructing the Gold Standard*, pp. 27, 28.

had been adopted on over £90 billion of procurements.[209] The structure of *FAC-1* is illustrated in **Figure 7.**

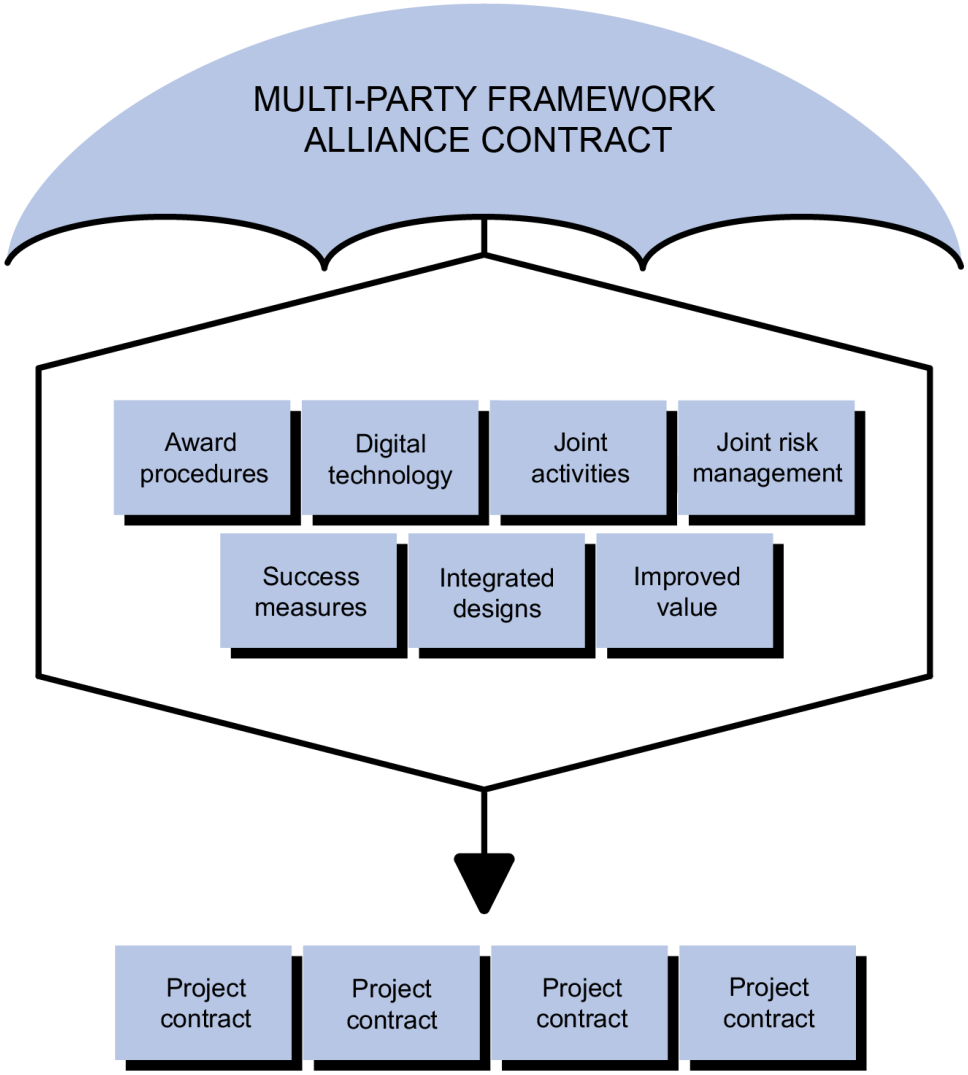

Figure 7: Structure of an *FAC-1* framework alliance contract[210]

Long-term strategic relationships under a framework alliance contract enable teams to develop mutual confidence and to share information that will enhance net zero carbon solutions. *FAC-1* defines *'Sustainability'* as *´measures intended to reduce carbon emissions, to reduce use of energy and or natural and manmade resources, to improve waste management, to improve employment and training opportunities and otherwise to protect or improve the condition of the Environment or the well-being of people.'* [211] The *FAC-1* contractual machinery governing joint actions to develop and implement net zero actions includes *Supply Chain Collaboration* with tier 2 and 3 supply chain members, linking agreed actions and improved outcomes to incentives such as additional or longer-term sub-contracts.[212]

[209] http://allianceforms.co.uk News and Users. The *FAC-1* Framework Alliance Contract has also been translated and adapted for use in Brazil, Bulgaria, Germany, Italy, Peru, Portugal, Russia and Spain.
[210] *Constructing the Gold Standard*, p.26.
[211] *FAC-1* Framework Alliance Contract Appendix 1.
[212] *FAC-1* Framework Alliance Contract clause 6.3.

The Construction Playbook acknowledges the potential of the *FAC-1* framework alliance contract to deliver improved value and states that:

- *'A successful framework contract should be based around principles that align objectives, success measures, targets and incentives so as to enable joint work on improving value and reducing risk.*
- *This should then be combined with transparent performance measurement and work allocation procedures.*
- *The FAC-1 framework is a good example of a standard form framework contract that can achieve this and many of the ambitions set out in this Playbook´.*[213]

The *FAC-1* framework alliance contract is being used by public and private sector clients such as Crown Commercial Service and LHC on their *MMC* programmes and all their framework alliances, by NHS Shared Business Services on their construction framework alliances, by Kier Highways on their supply chain alliances, by the Football Foundation on their *MMC* programme and by the Ministry of Justice on their £1 billion new prisons alliance using a strategic approach to *ESI*, *MMC* and *BIM* agreed between four tier 1 contractors. [214] Outside the UK *FAC-1* is being used on a range of projects such as windfarms being procured by the Italian energy company Enel, and the integrated procurement of a school project and a university campus project in Italy using *BIM* .[215]

Crown Commercial Service reports that *'The FAC-1 Framework Alliance Contract enables the government to align its strategies in construction with the key objective policies outlined in the Construction Playbook. The benefits of this drive improvements across the construction industry including:*

- *Ability to influence design through earlier contractor engagement*
- *Connecting whole life considerations through an integrated supply chain*
- *Focus on newer and safer working practices in construction*
- *Options for innovative construction methods and technologies*
- *More opportunities for SMEs, specialists and local providers*
- *Sustainable solutions and environmental benefits'.*[216]

The Construction Playbook recommends that collaboration through alliancing arrangements *'should be considered on more complex programmes of work as the effective alignment of commercial objectives is likely to improve intended outcomes as well as drive greater value for Money.'*[217] Alliancing on of UK infrastructure projects and programmes is supported by the initiative known as '*Project 13'*, which seeks *'to develop a new business model – based on an enterprise, not on traditional transactional arrangements – to boost certainty and productivity in delivery, improve whole life outcomes in operation and support a more sustainable, innovative, highly skilled industry'*.[218] The Construction Playbook notes that the Crown Commercial Service framework alliances are *'integrating FAC-1 and Project 13 principles.'*[219]

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[213] *Construction Playbook*, p.42.
[214] *Constructing the Gold Standard*, p.28 and http://allianceforms.co.uk News and Users.
[215] http://allianceforms.co.uk News and Users.
[216] *Constructing the Gold Standard*, p.28.
[217] *Construction Playbook*, p.41.
[218] https://www.project13.info/about-project13/
[219] *Construction Playbook*, p.27.

Alliances and relationship management: The Anglian Water @one alliance used alliance collaboration to enable a 50% reduction in embodied carbon. The @one Alliance case study demonstrated how '*collaborative and integrated teams have pooled their combined expertise and their broader partner capability to deliver innovative solutions and have been driven to meet what at first sight looked an unlikely target'*.[220]

10 Whole life procurement and digital information

Clients, consultants, contractors and supply chain members should agree and implement net zero commitments to whole life procurement through digital information management supported by a multi-party contractual integrator that governs exchanges of accurate data in relation to design, cost, time, risk and operation.

Achieving net zero targets requires an approach to procurement that reduces carbon emissions over the whole life of a project. Lifecycle procurement is a central feature of many private finance initiative projects and other public private partnerships, and framework alliances and term alliances also offer whole lifecycle procurement systems[221] and case studies.[222] Many contractors and manufacturers offer works and services covering the whole lifecycle of an asset, and *FIDIC* and *NEC4* have both published Design Build Operate (DBO) contract forms that enable procurement to cover the lifecycle of an individual project. [223]

The Construction Playbook focuses on whole life performance and requires that '*where appropriate, contracts should be written to include clear expectations for completion, maintenance and transition arrangements'*, with 'a *clear understanding of how maintenance will be managed in a timely and efficient manner as set out in the contract.'*[224] However, the industry, its clients and their advisers remain focussed primarily on procurement of the capital expenditure phase that covers project design and construction rather than on procurement of the repair, maintenance and operation phase and its potential for long-term efficiencies. One contributor to *Constructing the Gold Standard* described whole life procurement as *'the unattainable Holy Grail of construction procurement.*'[225]

A change in this mentality is essential to achieve net zero carbon targets, and the digital management of whole lifecycle asset information offers one way to challenge the prevailing approach. Digital technology can improve the ability of a team to create new connections between its members and can integrate the capital and operational phases of one or more

[220] *Collaborative Construction Procurement and Improved Value*, p.299.
[221] The Crown Commercial Service *FAC-1* framework alliances were procured on the basis of supplier capability and proposals that include up to 7 years of repair, operation and maintenance following completion of each project, and they offer this option to all their client users. https://www.crowncommercial.gov.uk/products-and-services/buildings
[222] For example, Welwyn Hatfield Council, *10 Years of Partnering Contracts*, p.45.
[223] *FIDIC* Conditions of Contract for Design Build and Operate (Gold Book) 1st Edition 2008; *NEC4* Design Build and Operate Contract 2017.
[224] *Construction Playbook*, p.69.
[225] Confidential submission to Professor David Mosey, March 2021, as part of the consultation leading to *Constructing the Gold Standard*.

projects if that technology is used alongside procurement models that invite the market to submit whole life asset management proposals.

Digitalising the design, construction and operation of a built asset can capture and retain a '*golden thread*' of information across its lifecycle which can improve environmental value. For example, *BIM* can help a team to meet its net zero carbon targets by validating relevant information, integrating professional contributions and building a '*digital twin*' that tests net zero carbon proposals before commencing construction.[226] *BIM* also facilitates the accessibility, coordination and updating of project information throughout the lifecycle of an asset, and its potential application to the whole life of a project is illustrated in **Figure 8.**

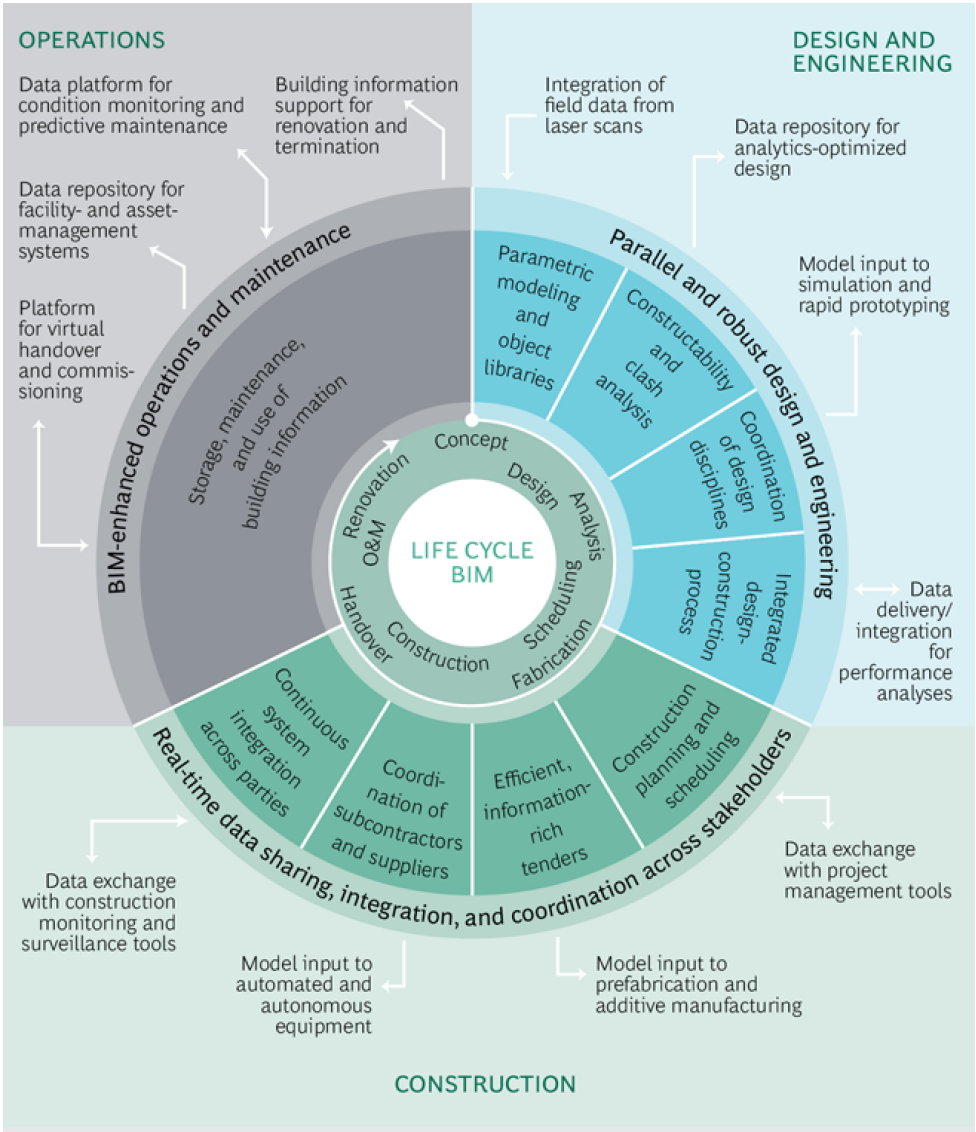

Figure 8: Application of *BIM* to the life cycle of an asset[227]

[226] *Towards a semantic Construction Digital Twin: Directions for future research*, Boje, C. et al, Automation in Construction 114 (2020) 103179.

[227] *The Transformative Power of Building Information Modelling*, Boston Consulting Group, https://www.bcg.com/en-gb/publications/2016/engineered-products-infrastructure-digital-transformative-power-building-information-modeling

'Good data underpins good decision making, and good carbon data is essential in understanding how to plan, design, deliver, and operate infrastructure'. **Skanska**[228]

Digital integration of the design, construction and operational phases in the life of a built asset forms part of the ISO 19650 suite of standards[229] which provides for interactive operation, repair and maintenance through the development and use of an '*Asset Information Model*'.[230] Digital integration of the capital and operational phases of a project is highlighted in the UK Government's '*Soft Landings*' programme where *BIM*:

- *'can play an important part in enabling a smooth transition from construction to operation*
- *'also helps clients to assure the performance of an asset and inform future project performance setting'*
- *'is also fundamental to maintaining the "golden thread" of a facility's purpose by aligning the interests of those who commission, design and construct with those who use and maintain'.* [231]

A successful whole life approach using *BIM* depends on creating contractual interfaces between the capital works team and the operation, repair and maintenance team through:

- Suitable intellectual property rights and licences in respect of *BIM* models and other design documents that enable the operation, repair and maintenance team to access and use all available asset information
- A clear interface between the defects liability obligations of the capital works team and commencement of the obligations of the operation, repair and maintenance team, with clarification as to who responds to notification of a problem and at whose expense
- An understanding of all exclusions and limitations in the liability of the design and construction team, including all specialist subcontractors, suppliers and manufacturers, so that it is clear where the operation, repair and maintenance team must step in to avoid leaving any gaps in the service
- Availability to the operation, repair and maintenance team of information regarding plant and equipment warranties, including the terms and conditions of those warranties, so that the operation, repair and maintenance team do not invalidate them through any act or omission
- A clear understanding of the specific obligations of the operation, repair and maintenance team in relation to warranted plant and equipment
- Clarity as to the liability of the capital works team, including subcontractors, suppliers and manufacturers, in the event of an error or omission by the operation, repair and maintenance team.[232]

Reduction of carbon emissions depends on the ability to undertake complex performance analysis, focusing on environmentally low-impact designs early in the design development

[228] https://www.skanska.co.uk/about-skanska/media/press-releases/252460/New-Infrastructure-Coalition-report-calls-for-urgent-action-on-carbon-measurement-to-achieve-netzero-by-2050
[229] ISO 19650-1 clause 4.2.
[230] ISO 19650-1 clause 3.3.9.
[231] file:///C:/Users/K1217231/AppData/Local/Temp/GSL_Report_PrintVersion.pdf
[232] *Collaborative Construction Procurement and Improved Value*, p.87.

process. For example, early design decisions can reduce a building's energy consumption by 80%[233] through optimizing its orientation, shape, size, insulation and ventilation.[234] Empirical studies show how an iterative digital design process can be used in conjunction with feedback from energy modelling in order to develop more energy-efficient designs.[235]

The development of effective building energy and environmental assessment tools and practices is crucial to ensure efficient design and operation[236]. To fulfil the operational potential of *BIM* data depends on the adoption of procurement models that invite the market to submit whole life asset management proposals. A digital *'life cycle assessment'* can then set out the method of measuring environmental performance and can lead to a more interoperable and open access to data, which can be used during the different phases of the lifecycle of an asset.

In order to minimise the environmental impact of a project, whole life carbon assessments need to commence as early as concept design (RIBA Stage 2 or equivalent) and as a minimum before the commencement of technical design (RIBA Stage 4 or equivalent) [237]. A further assessment should be undertaken at practical completion (end of RIBA stage 5 or equivalent) to measure the as-built outcomes against modelled assumptions and to determine the carbon impacts and emissions that need to be offset to achieve net zero carbon.

***BIM* and net zero carbon**: *BIM* contributed to the successful collaborative design and construction of **Istanbul Airport** and its recognition as a '*Green Airport'*. Digital information management enabled coordination between the contributions of all contractors and consultants which were enhanced by design decisions made through the use of *BIM* in conjunction with an effective '*Environmental Management Plan*'.[238]

Collaborative net zero decisions using *BIM* were also made during the construction of the **Shanghai Tower**, where the coordination between team members and teams reduced the carbon footprint and allowed energy efficient decisions to be made.[239]

Optimum reliable results depend on the integration of *BIM* with other design tools and with suitable procurement methods.[240] For example, there is a natural fit between digital technologies and the contractual systems governing *ESI* and *Supply Chain Collaboration*, and research undertaken by King's found that early adopters made effective use of *BIM* through collaborative procurement models that:

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[233] *Energy Efficiency in Buildings, Transforming the Market*, 2009. https://docs.wbcsd.org/2009/08/EEB-TransformingTheMarket.pdf

[234] *Promotion of New Technologies to foster SPP* Vornicu, R.- Example of BMI in construction sector, published in Andhov, M., Caranta, R., Stoffel, T., Grandia, J., Janssen, W. A., Vornicu, R., … Wiesbrock, A. (2020)- *Sustainability through public procurement: the way forward – Reform Proposals´*

[235] *Critical review of BIM-based LCA method to buildings* , Soust-Verdaguer, B. et al in Energy and Buildings Volume 136, 1 February 2017, pp. 110-120.

[236] *Green BIM – How Building Information Modelling is contributing to green design and construction,* Smart Market Report 2010, McGraw-Hill Construction, Bedford.

[237] HM Treasury, Green Construction Board, http://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2016/10/GCB-3YO-report-v11-final-PDF.pdf

[238]https://www.bimcommunity.com/experiences/load/142/bim-in-turkey-the-use-of-bim-on-the-istanbul-grand-airport

[239] https://www.arch2o.com/case-study-bim-shanghai-tower/

[240] *Building Information Modelling (BIM) for green buildings: A critical review and future directions,* Y. Lu, Z. Wu, R. Chang, and Y. Li, 2017. Automation in Construction.

- Brought all *BIM* contributors into the project or programme delivery team at the optimum time
- Used *BIM* to build confidence in, and reliance, on shared information
- Used *BIM* to assess the operational impact of the built asset through the application of *BIM* on those who operate, repair and maintain the completed capital project
- Created a set of contracts which clearly defined and integrated all the team members' roles and responsibilities. [241]

Other digital tools can promote the efficiencies required to achieve net zero carbon targets, both at the capital stage of a project and during its operational lifecycle. For example, a building's performance and efficiency can be monitored through the '*Internet of Things*'.[242] The use of '*Artificial Intelligence*' is also valuable in terms of its ability to digest huge volumes of data, identify patterns and enhance the ability to learn.[243] The application of '*smart contracts*' has created the ability to implement automatic supply transactions.[244]

The traceability of information is a key requirement in securing sustainable sources of supply. For example, '*Distributed Ledger Technology'* [245] creates a decentralized digital database that stores information securely and enables the simultaneous sharing and updating of records. *'Blockchain'* is a *Distributed Ledger Technology* which tracks and stores information from construction supply chain members and can enable more reliable monitoring of the sources of supply. *Blockchain* technology creates transparent and immutable records which can track the movement of goods, determine the authenticity of products and enable quality assurance that supports net zero carbon targets.

> *'Connecting resource flows between buildings and levelling out supply and demand through virtual platforms is a novel answer to implementing net zero at scale. Connector technologies like Blockchain, enable the mapping of transactions and create a platform to facilitate peer-to-peer trading that could turn consumers also into producers or "prosumers"'.* **AECOM**[246]

Digital technology can significantly enhance the operation of collaborative construction procurement, and commentators suggest that:

- *'What partnering needed to succeed was BIM and this risk-managing collaboration concept will probably return to favour in supply chain relationships'* [247]

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[241] *Enabling BIM through Procurement and Contracts*, ,Centre of Construction Law & Dispute Resolution, King's College London (2016), https://www.kcl.ac.uk/law/research/centres/construction/assets/bim-research-report-1-jul-2016.pdf
[242] https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
[243] https://www.ibm.com/cloud/learn/what-is-artificial-intelligence?mhsrc=ibmsearch_a&mhq=Artificial%20Intelligence
[244] https://www.ibm.com/topics/smart-contracts?mhsrc=ibmsearch_a&mhq=smart%20contracts
[245] *Distributed Ledger Technology- Beyond Blockchain*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf
[246] https://aecom.com/without-limits/article/chasing-zero/
[247] *Growth Through BIM*, Saxon, R., 2013, 5.27.

- *'The industry's route map to collaboration and high-efficiency new delivery models can only be underpinned by BIM and the importance of its adoption cannot be overestimated'*[248]
- *'Establishing a 'single source of truth' on projects for monitoring projects early, potentially supported by collaborative technology, helps to minimize misalignments and enable corrective action.'*[249]

The 2016 Farmer Review '*Modernise or Die'* highlighted the potential of *BIM* being used in conjunction with collaborative procurement as a means to address the limited take-up of *MMC*, stating that:

- The *´construction industry's collaboration problem is at the root of its change inertia'*,
- *´industry-wide adoption of digitisation through media such as BIM is predicated on collaboration"*
- The *'industry's route map to collaboration and high efficiency new delivery models can only be underpinned by BIM and the importance of its adoption cannot be overestimated.'*[250]

BIM, ESI* and *MMC: HMP Berwyn was one of the largest prison procurements in Europe and the Ministry of Justice team worked with Lendlease, AECOM, Sweett Group, WYG, Capita Symonds, TPC Consulting, Hoare Lea and Crown House during a 38-week preconstruction period to develop *ESI* contributions to design, risk management and the finalisation of agreed costs. MoJ applied lessons learned from the *Cookham Wood Trial Project*[251] which enabled additional benefits from *BIM* and greater *ESI* contributions from tier 2 and 3 supply chain members, including a specific focus on local and regional *SME*s.

From a budget of £212 million, the team agreed innovations and efficiency improvements that led to an agreed fixed price of £157 million without eroding the quality or function of the project. These included:

- Reduced cost and time on site using *MMC* standardised pre-cast provided by a range of European suppliers
- Reducing the footprint for the Entry Building/Energy Centre, using lessons learned from the MoJ framework's Oakwood Prison project and from consultation with operational colleagues
- Incorporating an open swale to create a new environment for wildlife while also reducing construction costs
- Overcoming significant environmental challenges caused by asbestos, soft ground conditions and the remains of an old munitions factory.[252]

[248] *Modernise or Die, Time to Decide the Industry's Future,* Farmer, M. (2016), p.36.
[249] *Reinventing Construction Through a Productivity Revolution* (2017), McKinsey Global Institute.
[250] *The Farmer Review of the UK Construction Labour Model*. file:///C:/Users/K1217231/AppData/Local/Temp/Farmer-Review.pdf
[251] https://constructingexcellence.org.uk/case-study-ministry-of-justice-new-prison-north-wales-two-stage-open-book/
[252] https://www.gov.uk/government/publications/procurement-trial-case-study-cookham-wood-prison

ISO 19650 states that '*Collaboration between the participants involved in construction projects and in asset management is pivotal to the efficient delivery and operation of assets*'[253] and it requires the use of collaborative tools in relation to '*procurement routes and appointment arrangements'*.[254] Also, the future of *BIM* outlined in '*BIM 2050'*[255] predicted that *'design consultants and principal contractors will be appointed simultaneously, early in the life cycle, to enable concurrent working at outline business case stage.'*[256] In order to achieve these objectives, *BIM* needs to be closely connected with integrated procurement models and collaborative contract systems.
On a single project or a programme of works, collaborative contract mechanisms help to integrate the digital contributions of all team members by clarifying:

- The impact of digital information on the timing of agreed activities
- The reliance by team members on digital information
- The responsibilities for managing digital information
- The links between digital contributions used for the design, construction and operation of multiple projects and programmes of work.

The *FIDIC* and *JCT* standard contract suites offer guidance in relation to *BIM* but do not integrate the *BIM* contributions of the different team members.[257] The *NEC4* and *PPC2000* contracts describe *BIM* obligations that are consistent across all team members[258], and the *NEC4 Alliance Contract* and *PPC2000* forms provide a multi-party structure for direct integration between the *BIM* contributions of different team members. For example, the *NEC4 Alliance Contract* provides for alliance members to integrate their contributions to *BIM* through:

- A shared '*Information Execution Plan'* which is to be issued and updated by the '*Alliance Manager'* [259]
- A single '*Information Model'* which is '*the electronic integration of Project Information in the form stated in the Information Model Requirements'*, to be created by the '*Alliance'* acting collectively subject to clarification of each alliance member's roles and responsibilities in an '*Implementation Plan'*[260]

[253] ISO 19650:1, p. vi.
[254] https://www.cdbb.cam.ac.uk/Resources/ResoucePublications/InformationManagementaccordingtoBSENISO19650GuidancePart1Concepts.pdf p.15.
[255] *Built Environment 2050 A report on our digital future*, CIC, http://www.cic.org.uk/download.php?f=be2050-cic-bim2050-2014-1.pdf
[256] *Built Environment 2050 - A report on our digital future*, p. 23.
[257] For example, an integrated approach to *BIM* using *JCT2016* contracts is limited by the absence of a private sector *JCT2016* consultant appointment through which to describe and integrate the *BIM* contributions of design consultants. https://www.jctltd.co.uk/product/bim-and-jct-contracts . Similarly, an integrated approach to *BIM* using the guidance in the *FIDIC 2017* Advisory Notes pp. 53-55 is limited by the absence of a *FIDIC* sub-contract through which to describe and integrate the *BIM* contributions of specialist sub-contractors and manufacturers.
[258] *NEC4* Option X10 and PPC2000 Appendix 10.
[259] *NEC4* Alliance Contract (2018) Option X10.1(1).
[260] *NEC4* Alliance Contract (2018) Option X10.1(3) and 10 .2.

- Agreement by alliance members to warn each other of *'any matter which could adversely affect the creation or use of the Information Model.'*[261]

Perceived threats to intellectual property rights are a serious obstacle to collaborative innovation through *BIM* because team members may be concerned that they will lose control of their original net zero carbon ideas[262]. Multi-party alliance contracts such as *PPC2000* help to avoid this roadblock by making clear:

- Direct agreement between team members of mutual intellectual property ownership rights and protections in respect of their contributions to *BIM* models and other digital information
- Direct grant of mutual, limited, non-exclusive intellectual property licences to reproduce, distribute, display or otherwise use those contributions
- Direct mutual commitments to create back-to-back arrangements with sub-contracted supply chain members.

Direct relationships between clients, consultants and contractors under a multi-party alliance contract can also:

- Ensure stronger commitment to shared net zero objectives and collective self-regulation, as well as to improved transparency and efficiency, creating the ability to share digital information on mutually agreed terms
- Enable collective decision-making so that the net zero outcomes from the digital technologies used on different projects are drawn together and applied more effectively
- Enable value-adding digital activities and processes, stating who works with whom and at what level of responsibility
- Clarify the whole life operational impact of digital information on the repair, maintenance and operation of completed projects.[263]

In order to develop and communicate digital information more efficiently across project teams, across project lifecycles and across frameworks, a multi-party alliance contract operates as an '*Integrated Information Management Contract'* which clarifies and connects the shared objectives, direct relationships and common standards that are needed to create, share and manage secure, resilient digital information among multiple organisations.[264] This brings to life the pivotal role of a collaborative approach to *BIM* in construction projects and asset management. An *Integrated Information Management Contract* can improve the efficiency of net zero carbon activities on a project or programme of works by:

[261] *NEC4* Alliance Contract (2018) Option X10 .4.
[262] Sections 5.21 and 6.10, Saxon, R. *Growth Through BIM*, 2013 https://cic.org.uk/news/article.php?s=2013-04-25-cic-publish-growth-through-bim-by-richard-g-saxon-cbe
[263] *Constructing the Gold Standard*, p. 52.
[264] https://www.cdbb.cam.ac.uk/news/research-profile-procurement-strategies

- Creating *BIM* information transparency and reliability through collaborative systems of information exchange and team integration
- Setting out agreed *BIM* deadlines, gateways and interfaces in a multi-party *Timetable*, with flexibility to bring in *BIM* contributions from specialist sub-contractors, suppliers, manufacturers and operators through *ESI* and *Supply Chain Collaboration*
- Supporting *BIM* with direct mutual licences of intellectual property rights
- Providing for clash resolution through *early warning* and *core group* decision-making.

As part of their research for the *Centre for Digital Built Britain*, King's College London Centre of Construction Law developed a template for an *Integrated Information Management Contract* based on the *FAC-1* framework alliance contract. This template is designed to govern the digital interfaces and relationships between the team members, between the stages of a project lifecycle and between multiple projects. It reflects recommendations in *Constructing the Gold Standard* [265] and early adopters have used it to agree and implement direct mutual commitments to *ESI*, *Supply Chain Collaboration* and *MMC.* [266]

11 Action plans and leadership

Clients and consultants should lead and manage the implementation of net zero carbon objectives under new and existing construction contracts, including through the agreement of net zero carbon action plans with binding timetables.

While there is widespread support in the construction sector for pursuing net zero carbon targets, urgent action is needed to convert this support into sustainable change. If net zero carbon objectives are not converted into improved practices through agreed *'action plans'* with binding timetables, then current inefficient procurement practices will hold us back.

A net zero carbon *action plan* can capture the agreement of clients, consultants, contractors and supply chain members to implement a shared timetable of specific activities that reflect the net zero strategy for each new procurement and each existing contract.[267] It should set out:

- How and when innovations and other improvements consistent with net zero carbon targets will be developed and agreed between clients, consultants, contractors and supply chain members, and how and when these innovations and other improvements will be adopted on specific projects
- How and when innovations and other improvements consistent with net zero targets will be captured from completed projects, and how and when these innovations and other improvements will be shared and agreed between clients, consultants, contractors and supply chain members for adoption on other projects.

[265] *Constructing the Gold Standard* Section 12, pp. 51-55.
[266] For example, on the Ministry of Justice four new prisons alliance, *Constructing the Gold Standard*, p.48.
[267] Action plans are described in *Constructing the Gold Standard* Section 5.

'While there is plenty of political and industry commitment to driving down carbon consumption, we lack consistent methods to achieving it. Put simply, the will is there but the tools are not'. **Skanska**[268]

Previous sections of this report have shown how to bring a net zero *action plan* to life on a new procurement. Equivalent systems for achieving improved environmental value can also be added to any existing contract. A net zero *action plan* under an existing contract can be expressed through supplemental mutual commitments which do not change the overall scope of the existing contract, do not change its agreed terms and do not breach public procurement regulations. Instead, the *action plan* can be set out in a supplemental contractual instrument governing implementation of the net zero objectives set out in the original contract, for example through:

- A '*supply chain framework alliance contract'* led by tier 1 consultants and contractors, which can harmonise and aggregate supply chain demand, can develop and integrate *ESI* relationships with tier 2 and 3 supply chain members through *MMC, ESI, Supply Chain Collaboration, BIM* and other means to deliver improved environmental value[269]

- A '*transitional framework alliance contract'*, which can aggregate and integrate the work of clients, consultants, contractors and supply chain members appointed under separate pre-existing contracts in order to clarify the shape, direction and expected outcomes of joint initiatives that explore the potential of *MMC, ESI, Supply Chain Collaboration, BIM* and other means to deliver improved environmental value.[270]

Net zero transitional framework alliance contract: Oxfordshire County Council and Skanska supplemented their £40 million per annum term contract for maintenance, capital renewals and new infrastructure to identify opportunities for improvement. The parties created an *FAC-1* transitional framework alliance contract to describe new binding procedures through which opportunities to capture improved environmental value were formalised and linked to extension of an underlying *NEC term call-off contract*.
The project teams identified significant opportunities, including carbon consumption reductions and financial savings. Strategic net zero carbon outputs, using *FAC-1* and supporting Oxfordshire County Council's and Skanska's carbon neutral targets, included:

- A suite of low carbon design solutions and associated action plans
- Development of a 'Partnership Carbon Reduction Strategy' and associated *action plan*
- Creation of a 'Whole Life Cost & Carbon' tool
- Focused training on lower carbon alternative materials
- Trials of new lower carbon materials
- Calculating carbon baselines for schemes to identify 'Hotspots'.[271]

[268] https://www.skanska.co.uk/about-skanska/media/press-releases/252460/New-Infrastructure-Coalition-report-calls-for-urgent-action-on-carbon-measurement-to-achieve-netzero-by-2050
[269] *Constructing the Gold Standard*, p.31.
[270] *Constructing the Gold Standard*, p. 31.
[271] https://allianceforms.co.uk/,News and Users.

Creating and managing net zero carbon *action plans* needs professional advice and active leadership. For example, industry review contributors to *Constructing the Gold Standard* highlighted how framework management practices can drive successful outcomes and how others can impede progress, with over 60% requesting more active framework management.[272]

The style of client leadership and professional management is also essential to creating and maintaining a collaborative culture. Where projects and programmes of work show evidence of collaborative leadership and management, this can motivate consultants, contractors and supply chain members to make additional efforts through their own leadership roles in the delivery of net zero carbon commitments.

Crown Commercial Service led and managed a transitional multi-party framework alliance through which appointed suppliers Aecom, AHR Architects, AMEC Foster Wheeler Environmental and Infrastructure, Arcadis, Capita, Faithful & Gould, Gleeds, Kier Business Services, Mace, McBains, Mott McDonald, Ridge, Turner & Townsend and WYG worked together '*to deliver improved value for framework clients by:*

- *Sharing and monitoring best practice intelligence*
- *Sharing and monitoring learning between projects and programmes of work*
- *Establishing, agreeing and monitoring consistent and more efficient working practices*
- *Agreeing and monitoring techniques for better team integration*
- *Agreeing and monitoring improved procurement and delivery systems on projects and programmes of work*
- *Sharing and monitoring other improvement initiatives created with contractors and other supply chain members.* '[273]

The collaborative leadership roles and responsibilities of managers need to be clearly stated in collaborative contract terms. They include the fair and constructive exercise of any discretion, and clarity as to how management authority is integrated with collaborative decision-making by a *core group*.[274] A manager needs to lead and coordinate the implementation of:

- Outcome-based net zero carbon strategies, procurement and incentivisation
- Strategic value improvement and risk management processes
- Consistent, proportionate and relevant performance measurement
- Collaborative decision-making and dispute avoidance.

Environment Agency reported that *'To help make a significant contribution to the Environment Agency's target of Net Zero Carbon in 2030, framework integrated delivery teams are supported by a Carbon and Cost Team. This Team provides an estimating and commercial intelligence service designed to ensure and assure, informed and effective, evidence based, whole life decision making across the business. Carbon and Cost services are provided through sub -teams for:*

- *Carbon and Cost Estimation;*
- *Commercial Intelligence and Benchmarking;*
- *Carbon Management and Assurance.*

[272] *Constructing the Gold Standard*, p. 32.
[273] *Constructing the Gold Standard*, p. 32.
[274] Section 8 of this report.

These teams maintain tools, systems, data and processes to provide a service that covers items as follows:

- *cost and carbon estimates throughout project and asset life cycles*
- *benchmarking and analysis);*
- *data validation and assurance;*
- *corporate reporting and evidencing construction contribution to net zero;*

supporting updates to standards via reviews of Minimum Technical Requirements and taking an evidence-based approach to low carbon.'[275]

12 The Four I's of net zero carbon procurement

The imperative of achieving net zero carbon has been made plain to the construction sector and its clients through new legal obligations and emerging measures of compliance. However, these obligations and measures are not likely to achieve the required results unless clients, their advisers and their supply chains also adopt and apply new approaches to procurement and contracting. This report has considered how new relationships, processes and tools will enable clients, advisers and the construction industry to play their part in ensuring that the procurement of projects and programmes of work achieve net zero carbon targets. It has addressed key questions of effective procurement that are linked to the *Four I's* of **intention**, **information**, **integration** and **incentivisation.**

In answer to these questions, this report has argued that a coherent approach to achieving net zero targets on any construction project or programme of works requires:

- **Strategies** that establish the **intention** of clients in terms of credible plans, commitments and timescales for meeting net zero carbon targets, with clear requirements for project outcomes and clear expectations for improved value and reduced risks
- **Procurement** processes that exchange relevant **information** between clients and prospective consultants, contractors and supply chain members in advance of making appointments, demonstrating and evaluating how plans, commitments and timescales to meet net zero carbon targets will be implemented
- **Contracts** that create and sustain the **integration** of the plans, commitments and timescales agreed by clients, consultants, contractors and supply chain members to implement the agreed steps to achieve net zero carbon targets
- **Management** that achieves **incentivisation** through instructions, support, guidance and motivation for clients, consultants, contractors and supply chain members to deliver their integrated net zero carbon targets using agreed plans, commitments and timescales.

The recommendations in this report show how clients, consultants, contractors and supply chain members can create and implement a strategic approach to net zero carbon in conjunction

[275] *Constructing the Gold Standard*, p. 34.

with other measures of improved value and reduced risks by adopting proven new approaches to:

- Client strategy and expectations
- Team evaluation and bidder proposals
- Early supply chain involvement and preconstruction activities
- Long-term contracts and industry investment
- Specialists and supply chain collaboration
- Contract governance and joint risk management
- Framework alliances and shared learning
- Whole life procurement and digital information
- Action plans and leadership.

'Only by working together sharing our learning and supporting each other's efforts will we make the difference that's needed.' **MACE**[276]

The imperative of achieving net zero carbon targets illustrates why more integrated, strategic and collaborative approaches to procurement should become the new commercial norms and should be embedded at all stages in the lifecycle of all construction projects. The conclusions drawn from the research and case studies supporting this report show why a more strategic approach to collaborative procurement and contracting, combined with a more integrated model for commitments to digital technology, are necessary changes in order for clients, advisers and other team members to:

- Identify and minimise the potential adverse impact of construction projects on the environment and achieve improved whole life project outcomes
- Identify the new and improved investments, innovations and solutions that clients, advisers and other team members need to adopt in order to meet net zero targets.

The systems described in this report enable clients and the construction industry to ensure that net zero carbon procurement escapes from *'the 'Groundhog Day' of lost learning from one project to the next.*'[277] They also create commercially robust collaborative relationships that avoid *'the 'Bermuda Triangle' of idealistic debate, cynical criticism and unrealised good intentions.*'[278] The systems described in this report are suitable for any project or programme of work in any jurisdiction. They are designed to create a strong collaborative procurement platform on which clients, consultants, contractors and supply chain members can develop and share the innovative solutions that are essential to meeting net zero carbon targets.

[276] https://www.edie.net/news/6/Mace-achieves-net-zero-operations-and-developments/
[277] *Constructing the Gold Standard*, p.3.
[278] *Constructing the Gold Standard*, p.4.