MOTT MACDONALD

PAS 2080

Putting carbon management into action

Contents

Introduction

Publication of the updated PAS 2080 carbon management specification in April 2023 was the starting point of a wider conversation on the importance of joined up thinking and a systems approach to decarbonising our built environment. Critically, the specification provided the impetus to bring together stakeholders from across sectors and value chains to explore progress made in adopting PAS 2080 and share challenges and opportunities.

This report provides highlights from the discussions co-facilitated by Mott MacDonald, with the support from Anglian Water and the Department from Transport (DfT), on decarbonising the built environment and putting PAS 2080 into action. The conversations covered three themes – systems thinking, procurement and decision making – and were run under the Chatham House Rule.

Why is PAS 2080 important?

PAS 2080 explains how to systemically cut carbon emissions arising from the construction, operation and maintenance of buildings and infrastructure. The updated standard built on the initial 2016 launch, which just considered infrastructure, with an expanded scope to include the whole built environment, a new emphasis on whole life carbon and climate resilience and a stronger message around the need for alignment with the transition to a net zero carbon economy.

Learning from shared experience

The round tables bought together Mott MacDonald's decarbonisation and asset management specialists with industry leading client organisations, value chain representatives and government bodies to look at what has worked well with implementation of PAS 2080 and consider where challenges exist.

Talking about the issues and sharing experience is necessary to make progress in improving our approach to decarbonising our built environment. We must also commit to action and recognise the need to try new ideas and ways of working, potentially fall short, learn and try again. The group that came together to mark the start of the conversation committed to reflect on key action points for industry to progress within the next 12 months. These actions will span the whole value chain and allow for continued engagement and collaboration between round table participants. Each of the three conversations around systems thinking, decision making and procurement develop three key action points which are set out in the final section of this report.

In addition, the update introduced the concept of "system of systems" interdependencies and the need for collaboration throughout the value chain. It challenged asset owners as well as government, regulators, investors and planning authorities to think, plan and deliver projects and operate infrastructure assets differently.

Systems thinking – Cross sector collaboration is key

Reducing carbon emissions to net zero and making society resilient to the physical effects of climate change are complex challenges that affect the whole of society and require systems-based solutions. Infrastructure organisations traditionally concentrate on project and asset interventions that solve problems and deliver benefits within a specific sector and context. In contrast, systems thinking offers a more holistic approach to delivering outcomes and recognises the interdependencies between different infrastructure assets, services and systems.

Ensuring a clear understanding of what is meant by systems thinking is critical as systems thinking differs from systems engineering. While the latter is mainly concerned with how physical things fit together, systems thinking includes human systems – for example, people and behaviour – as well as natural systems in the wider environment.

By identifying each of the features and functions that comprise a system and the interdependencies, as well as direct and indirect interactions that exist between them, systems thinking can deliver multi-benefits and multi-sector solutions. Using systems thinking is vital for PAS 2080 to be applied effectively. It's not enough to manage carbon at the level of the individual asset, or even the network that the asset is part of; carbon emissions across the whole system must be considered.

A comprehensive understanding of all the different system connections can be expressed through system maps that reveal the hidden complexity across a system, identify critical points of intersection that unlock multiple other benefits, or indicate where a system is stressed. Maps enable policy and decision makers and asset owners and operators to think about the interdependencies of the systems they control and how they influence others. System maps can also allow testing of the benefits and risks of conceptual policy choices and interventions on various systems to be better understood.

As an example, the Department for Energy Security and Net Zero and Department for Environment, Food and Rural Affairs and the DfT have collaboratively developed a net zero systems tool. The purpose is to support more joined up thinking and strategic alignment in the delivery of net zero across government departments and policies.

Systems thinking – Cross sector collaboration is key

Why together is better

While great efforts are being made to reduce embodied and operational carbon in infrastructure, there is often insufficient focus on what is being delivered and how it affects the overall system.

Moving to a systems approach calls for clarity about the trade-offs: is better mobility offered by a transport project, for example, desirable even if it consumes a large slice of the overall carbon budget? Can this be offset elsewhere in the system? The built environment industry needs to get better at identifying and valuing the co-benefits from interventions/projects across regions. Moving to a systems thinking approach doesn't necessarily change the outcome, but it provides greater transparency about those trade-offs.

One barrier to action is that it is often not clear which organisation has the "controlling interest" for a system and can make these judgments. For example, a metro mayor would be in a good position to take an overview of a city's systems, but that role does not give any powers over the electricity sector. Local authority planning departments take important decisions that affect multiple systems, but often lack the big picture view, as well as the resources and expertise, to do so effectively.

This highlights the need for a system integrator, a suggestion that was met with agreement during the round table discussions. The system integrator role could be fulfilled by an existing body, provided it has right level of authority and influence. The way this body engages with government and planning systems will be a key determinant of its success. One of the main enablers will be how a systems integrator can support better collaboration across organisational and sector boundaries will be critical. There are already tools available. For example, digital tools, including digital twins, can aid this collaboration. The Climate Resilience Demonstrator (CReDo) tool is a good example of systems thinking in action – could there be similar tools with other applications?

CReDo is a pioneering climate change adaptation digital twin project developed by the Centre for Digital Britain at the University of Cambridge to support the delivery of climate adaptation and resilience across a system of systems. By combining data and insights across sectoral and organisational boundaries, CReDo improves coordination of operational and investment decisions, including inter- and intra-sector collaboration, helping to increase resilience against extreme weather events.

What is needed are practical tools, like CReDo, that allow decisions to be made without necessarily having perfect data.

Local-level collaboration can also yield impressive results. Examples of this in action can be seen where waste heat from water treatment works were being used in agriculture or where utilities and local authorities were carrying out joint flood resilience projects. There should be more sharing of ideas across regions to explore whether solutions delivered successfully in one area would work in another part of the region. Incentives could help drive change and achieve objectives, if they are tailored to sectors and industries.

The existing language, when used to talk about systems and net zero, was also perceived to be creating a barrier to progress. Rather than using a “disaster narrative” of climate change, switching to highlighting the positive outcomes from net zero, such as improved air quality contributing to better health and wellbeing, could assist.

Complicated systems diagrams were also considered inaccessible and a barrier to some in participation; better to keep it simple and focus on the outcomes and benefits. A common language of outcomes and metrics is needed, so that the message can be taken further to those who currently don’t see the need for change and are continuing as they always have done. Mindsets and behaviours in the industry also need to adapt to the complex challenge of net zero. There is a need to move beyond the discreet, technical solutions favoured in the past to a more holistic system-of-systems approach that acknowledges everything is connected.

System-led interventions to support net zero will take time to develop, and may take longer to produce results, so patience and a long-term view is needed. As we look to expand the role of nature in addressing our challenges and delivering net zero, we must also allow for the opportunity to test and learn, as the effectiveness of interventions to a system may take time to monitor, measure and evaluate.

Systems thinking – Cross sector collaboration is key

Opportunities for systems thinking action

Systems have a complex combination of elements that are both human – people and behaviour – and technical – physical and technological. Identifying how all the parts connect and the value chain involved requires systems thinking. But too often, systems thinking is seen as an academic or technological process, and difficult for people to understand. This apparent inaccessibility makes it hard for people to engage and identify their role, as well as how a systems approach can benefit them or their organisations.

A common language and a simple step-by-step process would improve accessibility, encouraging leadership teams to adopt systems thinking to explore and deliver systemic outcomes. The introduction of board-level scorecards containing key performance indicators would drive progress. Digital twins are realistic digital representations of physical things. A static strategic planning digital model of a system can help unlock value by using data from across a system to improve insights and support more informed decision-making – leading to better outcomes in the physical world.

PAS 2080 encourages carbon emissions to be considered at a system scale. Assets need to be seen in the context of networks; networks in the context of systems; systems in the context of other systems. Integrating systems thinking into decision making from the start of projects or programmes would help planners and developers to focus on maximising the multiple positive outcomes – the co-benefits – rather than simply mitigating the negative impacts as a development proceeds.

The success of a systems approach relies on collaboration across multiple sectors. Bringing together the organisations responsible for planning, building and maintaining infrastructure at a city or regional level is no easy task. A systems integrator would be tasked with improving coordination of planning, maintenance and construction and for ensuring innovations and learnings are widely shared. Existing “integrators” include the London Infrastructure Group, established by the Mayor of London to agree a common vision for long-term infrastructure planning and jointly tackle issues in the infrastructure sector. However, it will be critical for the economic drivers and business case for change to be made clear, moral and ethical drivers alone are unlikely to be sufficient, especially for the public sector.

Procurement – Where targets meet reality

Procurement is the place where the strategic, sectoral, financial and environmental requirements of stakeholders meet with the practical realities of delivering low carbon projects and achieving net zero. It is here, through the contract arrangements that the value chain is incentivised – or not – to deliver the decarbonised systems and assets that clients, regulators, sponsors, insurers and governments require.

Recognising the critical role that procurement plays in decarbonisation, the updated PAS 2080 carbon management specification has introduced a new clause to enable the behavioural changes needed to drive down carbon. Clause 10 sets out detailed steps that all parties can take to achieve this through contract strategies, supplier engagement and sourcing of materials. It carefully identifies the roles and actions that each party in the buildings and infrastructure value chain can take to decarbonise.

The update comes at a challenging time for the industry. Lowering carbon and achieving the legally mandated net zero target must compete with other critical procurement objectives, such as improving social value or delivering net environmental and biodiversity gain. Procurement teams can find themselves faced with a multitude of competing priorities, making it more difficult to procure effectively. It also demonstrates the range of objectives that procurement teams are being asked to deliver through contract arrangements, significantly more than in the past.

Historically cost and time have been the most critical factors for all projects, and these remain at the forefront of delivery, yet they face more pressure as demand for resources continues to rise. The water industry is pursuing its largest ever five-year investment programme in asset management period (AMP) 8 from 2025 to 2030. Investment in tackling combined sewer overflows is set to triple, there are plans to build 10 new reservoirs and the industry has major plans to tackle leakage. At the same time record investment is being channelled into the UK energy sector as it upgrades and decarbonises the power system. Meanwhile major projects across all sectors continue to absorb resources. Supply and demand issues are therefore expected to have a significant impact on projects and programmes of work.

The role of procurement where these needs must be balanced, prioritised and incentivised throughout the value chain has, arguably, never been more important.

Procurement – Where targets meet reality

Beware of unintended consequences

Hard targets that are developed at a high level and translated into contract specifications without appreciation of key factors, such as local capability or logistics, can have unintended consequences and even prevent projects from achieving their decarbonisation goals.

As an example, using ground granulated blast-furnace slag (GGBS) in concrete to replace a proportion of cement is well understood as a low carbon alternative but, in an overheated market, suppliers may have to import the slag from overseas eliminating the low carbon advantages. Similarly, there may be a suite of opportunities to use a range of concrete mixes throughout a project. Specifying a single mix throughout could limit the potential for carbon savings.

Carbon pricing is also a key issue that needs careful consideration. Incentivising the value chain with a value for carbon that doesn't reflect the true cost of fuel switching won't have the benefits that clients might expect. A carbon weighting of £30/t does nothing to incentivise the use of alternative fuels such as hydrotreated vegetable oil (HVO) which can be £100/t more. This then throws up the important considerations around deep decarbonisation and reaching a tipping point where carbon and cost are no longer decreasing in parallel and decarbonisation has to be paid for. Gaining this kind of market and supplier level understanding is very challenging for procurement teams who are often given very limited information and short timescales in which to create contracts.

Speed was described as a "full blown cultural issue" for the industry which must be addressed in order to ensure that procurement is used effectively to drive change. The enormous value of effective procurement is not always recognised with procurement teams given very little time to gather information and contractors expected to quickly respond.

This means that there is a gap in terms of what is expected from procurement teams versus what they have the time and capability to deliver. Traditional contract models which emphasise time and cost are no longer adequate to meet the demands of a sector with many more requirements. New contract clauses such as the X29 clause in the NEC4 contract are showing promise. This option enables clients to set out climate change requirements for a contractor to comply with, alongside performance targets and incentives. However there needs to be much more support to train procurement teams that are expected to implement it and the clause itself will only work as intended if the asset owner has a mature understanding of the value chain. This is particularly important for project teams to prevent challenges and disputes later in the project with a risk emerging that contractors make assumptions in the that clients or designers don't accept later on.

Procurement – Where targets meet reality

Opportunities for procurement action

Moving forwards there are major opportunities for action that can help the industry to create the kind of procurement best practice that can catalyse change, empower supplier innovation and put carbon at the heart of decision making. Critical to this is early market engagement and earlier contractor involvement, including key suppliers such as steel, concrete and asphalt, enabling essential understanding of the possibilities and constraints while also driving collaboration.

One way to incentivise this is by using collaborative contracting models, such as the Project 13 enterprise approach. Moving away from transactional project by project contracting, this delivery model takes a long-term approach and brings the entire value chain into a single, integrated and collaborative group that is incentivised to achieve outcomes with risk attributed to align with capability.

Alliances or long-term frameworks were also considered to be important procurement routes with multiple advantages to the one team, one goal approach. One of the most important of these was the way that this can streamline procurement and promote long term partnerships and deeper collaboration. For example, a single PAS 2080 verified carbon management strategy can be established at the very start of a programme covering all of the projects ensuring best practice and maximising low carbon culture from the beginning.

However, careful attention must be paid to the allocation of risk. Contractors in these frameworks may not accept exposure to the actions of other parties in the alliance. This is where client maturity is particularly critical with frameworks that have been successfully performing over a long time period providing appropriate value chain incentivisation and evidence of the best outcomes.

With so many competing factors when it comes to project performance, flexibility is vital to delivering decarbonised projects. Target setting needs to come from the subject matter experts who take a systemic view but have also undertaken early engagement with the value chain to understand the possibilities.

Developing a building specification before the method of construction has been established can limit the opportunities. Designers might identify alternative lower carbon approaches, such as steel fibres in concrete, which become impossible to implement, or become a variation in a traditional form of contract, if the contractor has already purchased the rebar in a bid to secure the best price. Similarly, low carbon techniques and technologies are developing quickly meaning that contracts signed today must be able to incorporate the best practice options available several years later when construction begins.

At a deeper level flexibility in procurement could also mean working with the alliance or enterprise team to explore opportunities for optimising existing assets. This can take years of planning and development with the true potential only discovered through detailed exploration and collaboration. A new asset may not be needed at all if enough time and skill is applied to redeveloping the existing infrastructure.

More support for procurement teams and appreciation of the value of procurement could strengthen capability and improve decarbonisation outcomes. Training on the new forms of contract such as enterprise approaches and the X29 clause of NEC4 is essential as is more information on value chain interdependencies. The creation of procurement data sheets used to raise awareness of material issues might also be useful. These could provide detailed insights into performance characteristics of key materials and carbon implications of their use.

Allocating more time to developing the most effective incentives would be another way of supporting the professionals who develop the vital contractual framework that drives success (or failure). This sits alongside the need for earlier market engagement and would go some way to answering one of the most important questions raised when it comes to successful implementation. How do we get the right people around the table at the right time in order to have the conversations about how to ensure decarbonisation strategy is effective.

When it comes to procurement there is a single fundamental question that the entire value chain must ask. Do our contracts inspire innovation? If the answer is no, then taking steps to ensure earlier market engagement, empower flexibility and support procurement teams could all improve this.

Decision making – Data critical to carbon questions

Having the right governance, as well as defining the targets and baseline, is critical to informing decision making that drives carbon reduction throughout the whole project cycle. Nonetheless, the stage that these decisions are made – and by who in the value chain – can have a big impact on the scale of the decarbonisation offered. There are huge opportunities to reduce whole life carbon during the early stages of a project and the potential often reduces as the work progresses from planning and procurement through to design and delivery.

The challenge with making those critical decisions in the early stages is the lack of data to support decisions at that point, which often means that there is a balance to be struck. This leads to questions over whether there are enough benchmarks in industry to help decision making so that the sector can learn from past projects.

At every stage of a project, there are also questions to be asked on whether the built environment industry uses the right metrics to identify which design is the most carbon efficient.

Use of project or industry specific benchmarking and metrics is complicated and the sector does not yet have the answers, but a project or asset can no longer be considered in isolation. PAS 2080 brings in the systems thinking approach so it is not enough to just consider a project alone, the decision making process to drive down carbon must also be put in a systems context too. Whatever methods and tools are used to inform decision making, they must also deliver understanding of what those decisions mean beyond the project boundary as well.

The level of control and influence each decision maker within the value chain has both at the asset and system level needs to be considered too and questions asked about who in the chain is empowered to deliver the change needed to meet carbon reduction targets.

There will always be trade-offs and balances with different options available to decision makers but assessing these can be challenging. The water industry has started to use the six capitals framework, which puts a monetary value against natural, intellectual, manufactured, people, social and financial factors to create an actual financial societal carbon cost. This is used to add up the societal carbon cost of events such as a customer's property flooding or an interruption to water supply to help provide balance to the decision making process.

It is not a perfect method yet though. Use of the six capitals model works well at a theoretical level but getting the thousands of people "who touch a system" defined under model to apply a consistent approach is difficult. However, it does create a process to monetise everything to allow comparison of embodied carbon with a biodiversity credit or capex, opex or totex. This comparison is useful but whether it is the ideal mechanism for influencing better decision making is not yet clear.

Decision making – Data critical to carbon questions

Getting comfortable with uncertainty

It is apparent that data – and having more of it earlier – is key to more effective decision making when it comes to decarbonisation but is every sector in the built environment at the same early stage in developing that necessary information?

General consensus was that some parts of the construction sector are more advanced than others with the Crown Estates acknowledged as a leader with carbon data first starting to be published a decade ago. However, much of the sector is lagging behind and the overall construction industry is certainly behind other industries where the economic analysis, and the use of that analysis in decision making, is more advanced.

It is also evident that the sector must get much more comfortable with uncertainties around carbon cost if it is to be brought earlier into the decision making process. It was put forward that the industry accepts that cost estimates at the early stages of a project are not accurate, so it was questioned why the sector doesn't take the same approach with carbon too. Project managers have confidence in demonstrating why decision making has resulted in a rise in financial costs, so why is the same not true of carbon cost?

Uncertainties at the early stages are often drivers for the carbon footprint of a project rising as the work progresses into the delivery stages. While this can happen, it is not acceptable for the industry not to learn from past projects and it is critical that the whole value chain uses knowledge gained as benchmarks for improvement on future schemes.

Clients were identified as having a key role to play in ensuring carbon issues drive decision making from the very start of a project and proactive action is then taken at every stage to reduce carbon.

At tender stage, the industry has yet to move away from "cost is king" and greater weighing of carbon in the procurement process would force decisions that drive decarbonisation to be made earlier. The work undertaken to make carbon reduction a key factor in the procurement process for National Highways' Lower Thames Crossing was recognised as industry leading. The approach was praised for bringing the value chain into the decision making process on decarbonisation and setting up mechanisms that ensure the value chain is accountable for delivering on the promises made during the tendering process.

Decision making – Data critical to carbon questions

Opportunities for decision making action

While the value chain can influence the decision making process on carbon reduction at different stages, it was identified that infrastructure and asset owners have the potential to make the biggest impact. Nonetheless, while data was seen as critical to driving carbon reduction through better decision making, the need for a change in industry behaviours was also identified with a call for stronger leadership and more bravery.

To ensure carbon becomes part of the decision making process at every stage, it was suggested that clients should set a carbon budget to establish a baseline against which performance of different parts of a project or programme can be measured.

Comparing different parts of the value chain against that baseline would effectively create a league table of carbon reduction performance, which could be matched with financial incentives and penalties, to deliver changes in behaviours and empower the value chain to make better decisions to drive carbon reduction throughout a project cycle.

Using a carbon budget for a programme of asset delivery would also create the opportunity for higher carbon costs on schemes delivered early on to be accepted on the basis that knowledge gained can be used to improve carbon reduction decision making on elements delivered later.

The carbon budget concept for a programme of work also opened up how decision making impact over a longer period could change the way the industry invests in schemes. For example, if a programme is likely to need to use offsetting to reach net zero, could a higher investment earlier on drive innovation that would reduce carbon and avoid the need for offsetting?

The need for more sharing of consistent data and benchmarking of carbon performance across the industry was identified as a key action for the whole industry. The repeatability of civil engineering work on projects means that this should be possible but will need cross sector collaboration to be successful. The Built Environment Carbon Database has created a platform for baseline carbon setting in the highways sector and will soon be rolled out to the rail, energy and water sectors.

The six capitals were identified as having great potential to improve decision making but the organisations already using them need to share knowledge and best practice on the opportunities they bring, as well as the challenges they present in application. Organisations not yet using the approach were urged to consider how it could work for them.

Baking carbon reduction into contracts was seen as vital to ensuring carbon is considered in every decision and this lies entirely in the clients' hands. However, there were also calls for standard forms of contracts to establish mechanisms for carbon reduction to guarantee this process becomes business as usual rather than a contract variation.

Industry call to action

The conversations in all three round table sessions helped to identify issues and challenges the industry is facing in applying and using PAS 2080 effectively to manage carbon. There is a need for transformational change in the sector. However, participants in each of the sessions identified three actions for construction sector to deliver in the next 12 months as a starting point in order to move the adoption of PAS 2080 to a better place.

None of the actions identified will resolve the issues in isolation so all of the actions need to be applied wherever possible, across systems thinking, procurement and decision making. Similarly, a single member of the value chain applying the actions in isolation is not enough. To make a difference, it will call for cross industry collaboration with the actions applied at every level of the value chain over the next 12 months to move the sector forward.

Taking these actions will not be the end point for the sector though. Successfully implementing the improvements identified by the round table participants will create a foundation on which to tackle the more difficult challenges as the sector progresses towards carbon net zero.

Put the PAS 2080 actions into motion

Systems thinking

Create a common language – Simplify systems thinking to make it accessible to more people by establishing a common language and developing guidance to support engagement, conversations and collaboration.

Use digital tools to identify opportunities – Use tools, such as CReDo, and develop digital twins to help identify opportunities, multiple benefits, risks and trade-offs.

Initiate systems thinking earlier – Integrate systems thinking into decision-making from the start of projects/programmes by building capacity within existing cross-system organisations, such as the London Infrastructure Group, to act as a systems integrator at a city/regional level.

Procurement

Earlier market engagement – Use collaborative contracting models, such as Project 13 enterprise approach, to drive early market engagement to enable essential understanding of the possibilities and constraints while also driving collaboration.

Empower flexibility – Forms of procurement must have enough flexibility to allow for design changes and innovation that will drive decarbonisation to be implemented after contract award.

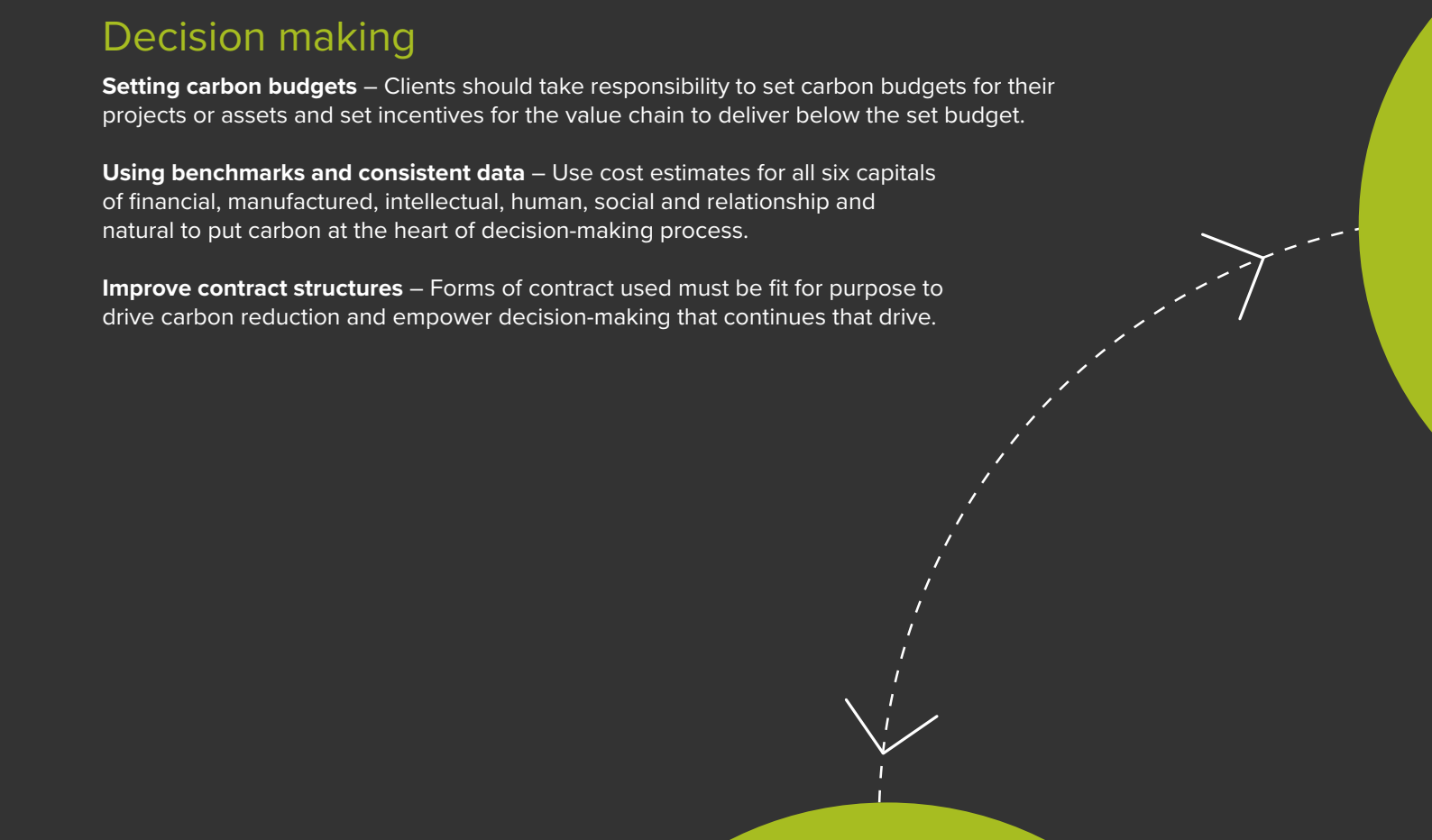
Strengthen procurement resources – Focus is needed to train and upskill procurement teams to give them the capability needed to assess bids on carbon in the same way they do for cost and quality.

Decision making

Setting carbon budgets – Clients should take responsibility to set carbon budgets for their projects or assets and set incentives for the value chain to deliver below the set budget.

Using benchmarks and consistent data – Use cost estimates for all six capitals of financial, manufactured, intellectual, human, social and relationship and natural to put carbon at the heart of decision-making process.

Improve contract structures – Forms of contract used must be fit for purpose to drive carbon reduction and empower decision-making that continues that drive.



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