SUSTAINABILITY GOVERNANCE IN THE DELIVERY PHASE OF INFRASTRUCTURE – TWO CASE STUDIES FROM THE URBAN RAIL SECTOR

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A thesis presented for the Degree of Doctor of Philosophy

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The work presented in this thesis is, to the best of my knowledge and belief, original except as acknowledged in the text. I hereby declare that I have not submitted this material, either in full or in part, for a degree at this or any other institution.

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Jane Scanlon
2011
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I hope I have done you all proud.
Scanlon, Jane, ‘The Role of Sustainability Advisers in the Delivery of Urban Rail Infrastructure Projects’ (paper to be presented at Australian Railway Association Inc’s Rail and the Sustainability Challenge, 26-27 October 2011, Canberra, Australia)

Scanlon, Jane and Adam Davis, ‘The Role of Sustainability Advisers in Developing Sustainability Outcomes for an Infrastructure Project: Lessons from the Australian Urban Rail Sector’ (2011) 29(2) Impact Assessment and Project Appraisal 121

Scanlon, Jane ‘A Framework for Governing Infrastructure Sustainability’ (paper presented at University of Pittsburgh’s Engineering Sustainability 2011 – Innovation and the Triple Bottom Line conference, 10-12 April 2011, Pittsburgh, America)

Scanlon, Jane and Stuart Hodgson, ‘Delivering Urban Rail Sustainably’ Rail Express – Critical Issues for Rail’s Key Areas (Special Edition Issue 2, Informa Publication, August 2010) 48


Scanlon, Jane, ‘Climate Change Adaptation – Perspectives from the Urban Rail Sector’ (presentation at the National Climate Change Adaptation Research Facility's 3rd Early Career Researchers National Forum and Workshop, 19-21 April 2010, Gold Coast, Australia)

Scanlon, Jane, ‘Delivering Sustainable Infrastructure – the Role of Sustainability Assessment’ National Outlook (Australian Consulting Engineers Association, Autumn 2009) 22

The author has also presented at numerous less formal industry and client events on the outcomes of this research as Senior Consultant Sustainability and Climate Change at Manidis Roberts. She has also been invited to sit on a panel at the Australian Green Infrastructure Council’s forthcoming National Conference in Melbourne 7 October 2011 because of her involvement (peer reviewer and editor) in the development of Theme 1 – Governance of AGIC’s rating tool (see www.agic.net.au). This involvement has been facilitated and informed by this research.
Infrastructure sustainability is a set of processes, activities and practices that pertains to the delivery phase of an infrastructure facility, such as a road or rail line. These processes, activities and practices minimise negative impacts and maximise opportunities across environmental, social and economic dimensions. Managing or ‘governing’ infrastructure sustainability is the focus of this research.

There has been little academic research in this area, and while industry organisations have developed sustainability-rating tools that aim to publicly recognise sustainability outcomes in infrastructure delivery (which includes planning, design and construction), they provide only limited guidance on how to achieve or manage the outcomes that they assess.

This thesis adopts case study methodology to explore the concept of governing infrastructure sustainability. The key aim of this exploration is to develop a framework that provides clearer guidance on governing infrastructure sustainability than has been available to date. The framework includes five stages and various steps within each stage.

Two case studies approaches are explored – the Sydney Metro Authority (SMA) in Australia and the London 2012 Olympic Delivery Authority’s transport division (ODAT) in the UK. Data collection methods comprised semi-structured interviews and review of related documentation, such as design and procurement. An inductive approach to data analysis of discovering themes and patterns in the data while integrating existing theory has been adopted.

The key components and features of each approach to governing infrastructure sustainability are mapped out, with key challenges and how they were overcome discussed. Each case study approach is categorised under six different key components: i) overall structure: Sustainability Management Framework for SMA and Sustainability Management System for ODAT, ii) interfaces between the approach and planning approval, design and procurement processes, iii) roles and responsibilities in infrastructure sustainability, iv) decision-support tools including feasibility studies on specific initiatives, v) measuring, monitoring and reporting mechanisms, and vi) knowledge-sharing and capacity building activities.

The framework developed in this thesis not only fills the gap in the academic literature, it also provides a promising approach for sustainability advisers and other industry professionals to adopt on real-life infrastructure projects. This thesis will therefore be of interest and value to academic researchers, as well as infrastructure industry professionals. It will also assist in the further development of relevant rating and assessment tools.
LIST OF ACRONYMS

AGIC – Australian Green Infrastructure Council
BS – British Standard
CBD – Central Business District
CEEQUAL – an assessment and awards scheme for improving sustainability in infrastructure projects
CEO – Chief Executive Officer
EMS – Environmental Management System
EP&A Act – Environmental Planning and Assessment Act 1979 (NSW)
FIDIC – International Federation for Consulting Engineers
GHG – Greenhouse gas
GM – General Manager
IMO – Integrated Metro Operations
ISO – International Standards Organisation
LCA – Life-cycle assessment
LOCOG – London Organising Committee of the Olympic Games and Paralympic Games
NSW – New South Wales
PBACH – Engineering and Architectural Advisor to the Sydney Metro Authority
PPP – Public private partnership
PRI – Permanent Route Infrastructure
ODA – Olympic Delivery Authority (corporate)
ODAT – Olympic Delivery Authority (transport division)
RFP – Request for proposal
SIR – Sustainability Initiatives Register
SMA – Sydney Metro Authority
SoCs – Statement of Commitments
SSHEQ – Sustainability, Safety, Health, Environment and Quality Management System
SuMS – Sustainability Management System
TfL – Transport for London
UK – United Kingdom
I INTRODUCTION

A Background and Research Problem

1 Infrastructure

(a) Infrastructure and Sustainable Development

Infrastructure is the underlying foundation of a system. In the context of a city, it can include roads, urban rail lines, energy substations and telecommunication towers.\(^1\) When such structures are complete, they can be termed ‘infrastructure facilities’, and when they are in the process of being built, they can be termed ‘infrastructure projects’.

The provision of infrastructure can result in economic development and social well-being,\(^2\) for example where transport infrastructure facilities improve access to goods and services.\(^3\) Because of this correlation, the concept of sustainable development is intrinsically linked to infrastructure. Sustainable development can be broadly defined as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’.\(^4\) The concept has been developed in the international arena since this definition was first coined by the Brundtland Commission in 1987. Since 1987, numerous international forums have re-visited the concept and imperative of sustainable development including the United Nations Conference on Environment and Development in 1992 and the United Nations Johannesburg Summit in 2002. Governments, industry and the research community have also been active in developing the concept with a common approach being to enshrine it

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in the three dimensions of social, economic and environmental where economic growth, environmental protection and enhanced well-being of society are sought.\(^5\)

Individual infrastructure facilities can contribute to the sustainable development of society where they add value across these three dimensions. Facilities that add value to the social dimension may enhance the mobility of people in the community thereby increasing access to goods and services, for example an inclusive public transport facility. Facilities that contribute positive environmental outcomes, for example renewable energy facilities that reduce dependency on fossil fuels for the production of energy, are often regarded as ‘sustainable’\(^6\) and gain public acceptance. Sustainable infrastructure facilities will be economically viable to operate and use, or financially affordable for the intended beneficiaries.\(^7\) Hence, sustainable infrastructure facilities contribute to the economic and social development of society while maintaining environmental integrity.

(b) Impacts of Infrastructure Project Delivery

Although an infrastructure facility may, by its very nature, contribute to the sustainable development of society – for example, a renewable energy facility – the process of delivering any infrastructure facility will result in various social, economic and environmental impacts. The type and scale of impacts is dependent on activities and decisions made during the delivery phase of that facility. As stated, during its delivery phase the facility can be termed the ‘infrastructure project’. An infrastructure project may involve the delivery of a completely new facility; or upgrading or in some way altering an existing facility such as an existing road. The delivery phase comprises the different stages that get the project owner, or proponent, from a concept to a constructed facility.\(^8\) For the purposes of this thesis, these


\(^6\) In this thesis, ‘sustainable infrastructure’ refers to facilities that – by their very nature – contribute to the economic and social development of society, while maintaining environmental integrity. The term ‘infrastructure sustainability’ is used in the context of the delivery phase of infrastructure facilities.


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stages are separated into planning and feasibility; planning approvals and procurement; detailed design; and construction and commissioning, outlined in Figure 1. Concept and pre-feasibility is known as the ‘project development’ phase. At this phase, the business context for the facility is being explored, key issues are identified and a preferred option generated. There is typically limited detail about the specific shape and form of the proposed facility or project at the project development phase.

Delivery phase activities affecting the type and scale of impacts include site selection during planning, choice of materials and quantities during design, and construction techniques affecting the degree of disruption to local communities, energy consumption and water pollution levels. There is an increasing amount of literature on the high environmental impact and consumptive nature of conventional construction techniques and materials. Hartshorn et al state that ‘efforts to ... build new infrastructure are often conducted with ... little or no consideration of mitigating, sustaining, and preserving natural capital.’ There is also literature on the social impacts of infrastructure project delivery, particularly construction, as well as economic impacts for example from inefficient project management resulting in project delays and increased project costs.

Although there is legislation, regulatory and pseudo-regulatory instruments such as voluntary standards in place to address impacts associated with infrastructure project delivery, there is consensus in the literature that the ‘status quo’ of project delivery is ineffective in holistically addressing environmental, social and economic dimensions. According to many commentators, traditional project delivery processes have been driven by economic

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9 The different stages often over-lap and their sequence will vary from project to project. Where this research is positioned in terms of the delivery phase is discussed in Section B(2) below.

10 See in general T G Carpenter, above n 2.


12 Hartshorn et al, ibid 173.


considerations, such as upfront capital cost and delivery schedule, and function and physical performance of the technologies and materials used. This creates a tendency for project proponents (or owners) and their delivery partners (including principal construction contractors and their sub-contractors, and consulting engineers and planners) to prioritise economic performance over social and environmental outcomes.

**FIGURE 1** – The project development phase, and project delivery phase and stages

(c) Drivers for Sustainability in Infrastructure Project Delivery

Despite the economic focus of traditional infrastructure project delivery processes, there are increasing drivers for proponents and their delivery partners to consider environmental and social project performance alongside economic. Drivers motivate or compel an organisation or individual to take some kind of action. They can be tangible, such a penalty resulting from a legislative instrument, or more intangible such as community value or perception. In the context of sustainability and infrastructure project delivery, drivers can be separated into policy and legislative, reputational and enhanced project outcomes. Responding to drivers will often result in the realisation of opportunities.

International, national, state and local governments have been active in developing sustainability policy for some time. But increasingly governments are starting to explore regulatory avenues that mandate action on social and environmental issues – influenced by

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17 Hartshorn et al, above n 11, 173.
18 Adapted from Shen et al, above n 7, 274.
increased community awareness on issues such as climate change. In Australia, examples of this include the National Greenhouse and Energy Reporting Act 2007 (Cth), which requires organisations meeting a certain threshold of greenhouse gas (GHG) emissions to undertake GHG assessments and reporting; and policies aimed at facilitating local and Indigenous employment opportunities. This increasing trend for governments to require proponents to address social and environmental issues will likely continue into the future. Proponents on the ‘front foot’ of regulatory changes, including those playing an active role in government policy development, are in a good position to pre-empt future requirements and reduce risk associated with non-compliance. They also may be in a better position to receive government funding for future projects where environmental and social performance is included in funding assessment criteria. Private investment decisions may also be influenced by certainty of proponent due diligence on social and environmental issues.

Increasing community awareness of issues such as climate change is translating into expectations that infrastructure project proponents and their delivery partners will act responsibly. Demonstrating due diligence on social and environmental issues can aid in gaining public acceptability for an infrastructure project. Proponents can also enhance relationships with delivery partners and employees by addressing infrastructure sustainability. For example the younger generation of employees may be attracted to, and be retained in, organisations that actively address social and environmental issues in addition

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19 For the purposes of this thesis, the terms ‘GHG’ and ‘carbon’ are used inter-changeably.
22 Australian Federal Government, ‘Schedule – Building Australia Fund Evaluation Criteria’ (Guidelines, Infrastructure Australia, date unknown)
25 Defined below in Section 2.
to economic. There may also be a feeling of pride in individuals involved in infrastructure sustainability, which will likely result in employee motivation and satisfaction.

Concepts like ‘lean construction’ and activities like ‘value management’ are increasingly being applied to infrastructure projects. These concepts and activities are about achieving better project – and often economic – outcomes for example through more efficient use of materials, and more effective and collaborative project management. There is also some evidence of a paradigm shift in the infrastructure industry to acknowledge that good economic outcomes do not have to be at the expense of positive social and environmental outcomes. Often efforts to reduce costs and streamline project delivery processes result in reduced environmental and social impacts. Energy efficient design that maximises the use of natural light, for example in the design of a station, or reducing quantities of materials such as concrete, have obvious environmental benefits of reduced GHG emissions, as well as reduced costs. Using the same example of station design, design features that improve user access, such as well-lit pedestrian paths and footbridges, can increase patronage thereby delivering positive social and economic outcomes. Further, encouraging local companies to compete for work on an infrastructure project can help build community acceptance for the project, and result in reduced employee or contractor travel time and reduced GHG emissions. These ‘win-win’ scenarios can lead to enhanced project outcomes across social, economic and environmental dimensions concurrently.

Minimising negative impacts, and maximising opportunities across these three dimensions will not always be ‘win-win’ and trade-offs will be implicit. Trade-offs have been discussed by numerous commentators. A trade-off would occur when achieving a positive outcome in

26 Due to, for example, increased exposure to sustainability concepts in tertiary education programs. See Part III B(4).
27 Carmichael and Balatbat, above n 21, 6.
28 For discussion on lean construction, see in general Klotz et al, above n 14. For discussion on value management, see in general Zainul Abidin and Pasquire, above n 5. See also Part III Section C(4).
29 See in general Nazirah Zainul Abidin and Christine L Pasquire, ‘Delivering Sustainability through Value Management – Concept and Performance Overview’ (2005) 12(2) Engineering, Construction and Architectural Management 168. This is also evidenced in the increasing number of sustainability performance assessment tools being developed at an international scale. See Section 3 below.
one dimension happens at the expense of one, or both of the other dimensions. An example can be taken from decisions relating to an infrastructure project’s supply chain. Sourcing timber from certified forests for biodiversity conservation reasons may require importing it from long distances. Transportation of the timber will contribute to the product’s embodied energy and greenhouse gas output. The positive biodiversity outcome should therefore ideally be considered in the context of contribution to climate change. Also, the certified requirements for the timber might exclude local producers that supply a similar product, which might have negative implications for the local economy and community. Trade-offs therefore result from inter-connected, and often-conflicting, economic, social and environmental dimensions. The issue of trade-offs is inherent in the infrastructure sustainability concept.

2 Infrastructure Sustainability

Broadly speaking, infrastructure sustainability is a set of processes, activities and practices pertaining to the delivery phase of an infrastructure facility. These processes, activities and practices seek to minimise negative impacts and maximise positive impacts and opportunities across economic, social and environmental dimensions over the life of a facility, during the project delivery phase. They also bring into balance short and long-term social, economic and environmental considerations, as opposed to conventional delivery practices that tend to focus on economic imperatives first and foremost. However, a central purpose of such processes, activities and practices is to ensure that an infrastructure facility delivers a positive overall contribution to sustainability.

Examples of infrastructure sustainability include implementing a local employment program, and restoring or rehabilitating local habitat. For the purposes of this thesis, infrastructure sustainability outcomes (sustainability outcomes) are the specific environmental, social and economic results of the processes, activities and practices, for example the successful

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31 Kemp et al, above n 5, 16.
33 Shen et al, above n 7, 273. This definition has synergies with concepts such as sustainable construction defined by commentators including Zainul Abidin and Pasquire, above n 29, 170. However, sustainable construction generally relates specifically to the construction stage only.
recruitment of individuals through a local employment program and subsequent community satisfaction or local positive ‘buy-in’; or a ‘net gain’ in biodiversity as a result of rehabilitation efforts associated with the project. Ideally, these outcomes will improve infrastructure project performance across one or more dimensions with no net loss of performance across the others.

As infrastructure sustainability relates to processes, activities and practices that take place during the project delivery phase, infrastructure sustainability ends at commissioning. However, infrastructure sustainability and sustainability outcomes will be influenced by and affect ongoing management and maintenance of the infrastructure facility over its working life – from commissioning to decommissioning and disposal. Using the above example, although a local employment program may be devised and implemented during planning and construction, the positive outcome it may have in terms of long-term public acceptance of the facility may continue long after commissioning of the project. The program may also include local employment objectives for operation of the facility.

A review of the literature reveals a number of principles of infrastructure sustainability. Four principles in particular allow for a better understanding of the infrastructure sustainability concept. These principles are beyond compliance, continuous improvement, whole-of-life thinking and innovation (Figure 2).

**FIGURE 2** – The principles of infrastructure sustainability

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Beyond compliance relates to proponents and their delivery partners establishing a voluntary commitment to go ‘above and beyond’ compliance with legal requirements, while recognising that compliance is also part of infrastructure sustainability.\(^{35}\) Legal requirements might include those relating to planning approval processes, where environmental impact studies may need to be conducted; and the occupational health and safety of project employees. In addition to legislation and regulation, there are other formal and less formal requirements such as industry codes and standard practice, and agreements with regulators. The principle of continuous improvement recognises that as technology, social expectations and other parameters are constantly changing, the goal posts for sustainability outcomes will always be moving.\(^{36}\) Indeed, the pursuit of sustainability outcomes is an open-ended, never ending process.\(^{37}\)

In the environmental dimension of sustainability, the International Organisation for Standardisation’s (ISO) 14001 on Environmental Management Systems (EMS) provides a framework for continuous improvement. The term ‘environmental management system’ is a generic term used to describe any systematic approach used by an organisation to manage its impacts on the environment.\(^{38}\) The process used in environmental management system implementation is predicated on the need for information to flow back to the manager to assist in their environmental management choices.\(^{39}\) However, EMS – as provided for under ISO 14001 – are underpinned by the principle of continuous improvement. Some commentators have examined the role of EMS in the attainment of sustainable construction.\(^{40}\) However, EMS is concerned primarily with continuous improvement in the environmental dimension and is consequently not in itself capable of addressing infrastructure sustainability as it is defined in this thesis. Further, EMS typically focus on meeting legislative


\(^{36}\) Hill and Bowen, ibid 233.

\(^{37}\) Kemp et al, above n 5, 16.


\(^{40}\) Hill and Bowen, above n 30, 237; Shen et al, above n 11, 65.
environmental requirements\textsuperscript{41} as opposed to going beyond compliance – one of the principles for infrastructure sustainability.

The principle of whole-of-life thinking is about being proactive and prepared for future changes, including pre-empting future requirements.\textsuperscript{42} Whole of life thinking is closely linked to design processes in the literature. Shen et al state that ‘design specifications on project components should consider the project’s economic, social and environmental performance across the project life-cycle’.\textsuperscript{43} A whole-of-life approach to design is defined by Mukherjee and Muga as ‘considering not only the current economic viability of a design alternative but also measuring its long-term economic, and environmental impacts \ldots\textsuperscript{44}’ Applying the principle of whole-of-life thinking into design processes relates to building in flexibility. Building in flexibility into the design of a rail station, for example, might take the form of adaptive air conditioning systems that can be enhanced in the event of increased number and severity of hot days resulting from climate change,\textsuperscript{45} or ensuring light fittings can be easily replaced to accommodate future standards around efficient lighting.

The principle of whole-of-life thinking also relates to making decisions based on whole-of-life costing. Whole of life costing is about assessing activities based on payback periods across a facility’s life, rather than its impact on first, or capital, cost.\textsuperscript{46} For example, the adoption of energy efficient technology may cost more than conventional options upfront, but over the life of the facility will pay itself back based on cost savings resulting from reduced energy consumption.\textsuperscript{47} According to Mirza, ‘sustainability can be achieved by changing the current practice of designing for the first [or capital] cost and focusing on the life cycle costs

\textsuperscript{41} Frank Vanclay, ‘How Do TBL, EIA, SIA, SEA and EMS Relate to Each Other?’ (2004) 6(3) Journal of Environmental Assessment Policy and Management 265, 279.
\textsuperscript{42} However as discussed by De Bruijn and Leijten, it is acknowledged that predicting future conditions is difficult and laden with assumptions, Hans De Bruijn and Martijn Leijten, 'Megaprojects and Contested Information' (2007) 30(1) Transport Planning and Technology 49, 53.
\textsuperscript{43} Shen et al, above n 7, 279.
\textsuperscript{45} The CSIRO outlines such impacts in CSIRO, Fact Sheet – Climate Change is Real <www.csiro.au/resources/Climate-change-is-real.html> at 4 October 2010.
\textsuperscript{47} Hartshorn et al, above n 11, 172; Pearce, above n 16, 292.
Part I Section A

of infrastructure ...'.

Mirza further adds that a small increase in the initial cost of the facility will usually pay dividends in terms of improved project performance, including durability, across the facility’s life.

Innovation is commonly linked to sustainability and is the fourth principle of infrastructure sustainability. Larson defines sustainability as ‘innovative and potentially transformative ... activities that generate new products and processes that challenge existing practice’. Innovation in the context of infrastructure project delivery is about project employees doing things differently from their normal pattern of behaviour. Other commentators discuss the role that innovation needs to play in infrastructure sustainability, stating that existing literature on this topic does not pay enough attention to the role of innovation. Examples of innovative practice include designs and techniques that consume less energy, generate less waste, have lower capital cost outlay and lower economic risk. Specific examples include trialling and implementing a low emissions lighting system, and creating partnerships with other organisations for water re-use. Infrastructure sustainability is a relatively new research area and unlike the building industry, the infrastructure industry has only recently started exploring approaches to sustainability. The infrastructure industry in the UK and Australia has started to develop and apply sustainability performance rating tools aimed at rewarding infrastructure sustainability. These tools include CEEQUAL, an assessment and awards scheme for improving sustainability in infrastructure projects and the environment.

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49. Mirza, ibid 645.
50. Here the term ‘sustainability’ is used in a broad sense, as opposed to ‘infrastructure sustainability’ which is a more specific term relating to infrastructure projects.
53. Dewberry and Monteiro de Barros, above n 51, 34.
55. Hartshorn et al., ibid 172.
57. See Part IV Section B(9).
the Australian Green Infrastructure Council’s (AGIC) sustainability-rating scheme, which is still under development. Also, sustainability performance assessment tools are being developed through academic research, particularly in the engineering and construction disciplines. The broad definitions of infrastructure sustainability applied in these tools vary, although most refer to the three dimensions of social, economic and environmental.

Often these rating and assessment tools then categorise infrastructure sustainability into various social, economic and environmental impact and opportunity areas, or ‘themes’, such as material and resource use, biodiversity, climate change, pollution, workforce well-being, community issues, and project management and governance. These themes are sometimes referred to as high-level ‘indicators’ through which to measure sustainability performance, under which are more specific indicators relating to each theme. The use of these themes is a means of breaking down infrastructure sustainability into something manageable in the context of delivering an infrastructure facility. As such, the following themes are adopted to further frame the infrastructure sustainability concept:

1. Project management and governance – reflect key components of the approach to governing infrastructure sustainability.
2. Resource use – responsible material selection and use.
3. Emissions – manage GHG emissions, and discharges to air, water and land.
4. Biodiversity – enable functioning ecosystems, and enhance biodiversity.
5. Infrastructure resilience – consider whole-of-life implications, and adapt to potential climate change impacts.
6. Socio-economic – enhance living conditions and promote economic opportunities.
7. People and place – promote safety, health and well-being of internal and external stakeholders both now and into the future.

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58 See <www.agic.net.au> and Section C below.
59 Koo et al, above n 16, 766; Edum-Fotwe and Price, above n 16, 314; Shen et al, above n 7, 273.
60 See for example the Australian Green Infrastructure Council’s sustainability-rating scheme themes and categories in Fact Sheet No 2 – AGIC Infrastructure Sustainability Assessment Categories 2009 <www.agic.net.au/fact_sheet_2_agic_infra_sustainability_assessment_categories.pdf> at 9 September 2010; and Koo et al, above n 16, 767. Such themes are also adopted in the literature including by Koo et al and Fernández-Sánchez and Rodríguez-López. See in general above n 16, and Gonzalo Fernández-Sánchez and Fernando Rodríguez-López, ‘A Methodology to Identify Sustainability Indicators in Construction Project management – Application to Infrastructure Projects in Spain’ (2010) 10(6) Ecological Indicators 1193.
61 Koo et al state that ‘the magnitude of sustainability can be measured through a group of indicators including ecology, socio-culture, history, politics, economics, technology, regulation and natural resource’, Koo et al, above n 16, 767-68.
It is acknowledged that the categorisation of infrastructure sustainability may be classed as reductionist. Mukherjee and Muga remark that the study of sustainability in the built environment, which includes infrastructure sustainability, has taken a fragmented approach to study an issue that is complex and a ‘systems problem’. Systems problems are complex and inter-disciplinary, and with infrastructure relate to co-dependencies between project components and their relationship to the environmental and social contexts. They state that sustainability presents a fundamental dilemma – on the one hand it is necessary to use the systems paradigm to frame problems, while on the other hand it is necessary to employ reductionist approaches to study specific elements of it, for example GHG emissions and materials wastage. They state that this places the responsibility in the hands of decision-makers, and their role in re-integrating individual problem components, to undertake infrastructure sustainability with the ‘bigger picture’ in mind. However, due to the complexities of infrastructure sustainability, it is necessary to adopt the aforementioned seven themes in order to investigate and apply the concept in both a manageable and meaningful way.

3 Governing Infrastructure Sustainability

(a) Definition

Given the crucial role of decision-makers, it is also necessary to examine infrastructure sustainability in the context of decision-making during the project delivery phase. This has clear links with the project management and governance theme adopted by many of the sustainability performance assessment and rating tools. Of the various infrastructure sustainability themes, the project management and governance theme is pivotal to achieving infrastructure sustainability. It is the only theme that directly concerns the relationship between the concept and project delivery processes, and is therefore process-oriented rather than impact or opportunity area-oriented.

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62 Mukherjee and Muga, above n 44, 199.
63 Ibid 201.
64 Ibid 199.
65 Ibid 199.
66 Including the Australian Green Infrastructure Council’s tool; the UK (and now international) CEEQUAL scheme; and Fernández-Sánchez and Rodríguez-López, above n 60, 1200; see Section (b) below.
For the purposes of this thesis, the project management and governance theme is termed ‘governing infrastructure sustainability’, where aspects of project management and its implications for infrastructure sustainability are absorbed into the term. In a broad sense, Kemp et al define governing as ‘a purposeful effort to steer, guide, control and manage (sectors or facets of) society’.\(^{67}\) AGIC defines project governance as involving the ‘establishment and oversight of an organisational structure and its operation for the effective ... delivery of a project’.\(^{68}\) Project management in the context of infrastructure sustainability is defined by CEEQUAL as the consideration of how sustainability issues are being incorporated into the overall management of the project.\(^{69}\) Adapting these definitions, governing infrastructure sustainability can be defined as the establishment and oversight of a structure to purposefully manage infrastructure sustainability and sustainability outcomes during the project delivery phase.

This definition of governing infrastructure sustainability is two-fold. On the one hand it is about embedding and integrating infrastructure sustainability into project delivery processes,\(^{70}\) as highlighted by CEEQUAL, and aligning project delivery processes with desired sustainability outcomes.\(^{71}\) On the other hand it is about how infrastructure sustainability, comprising various processes, activities and practices for achieving sustainability outcomes, is managed during project delivery. These two aspects are not mutually exclusive.

(b) State of Play

This research is positioned outside of the discipline or research area of ‘sustainability assessment’. Sustainability assessment has arisen as a means of using impact assessment processes to direct planning and decision-making toward sustainability outcomes.\(^{72}\)


\(^{68}\) AGIC, above n 60.

\(^{69}\) CEEQUAL, above n 38, 7.

\(^{70}\) AGIC, above n 60.


Sustainability assessment generally relates to planning processes and – at the project-level – determining whether a project proposal makes a contribution to sustainability or is a ‘sustainable’ initiative.\(^{73}\) Further, although there is little consensus regarding the meaning of sustainability assessment,\(^{74}\) sustainability assessment seems to focus on the planning stages of an infrastructure project, as opposed to the project delivery phase as a whole.

This thesis does not examine processes that enable decision makers to determine whether an infrastructure project should be approved, or is ‘inherently’ sustainable. It does not examine how impact assessment policies, regulations or procedures can be altered to more effectively address sustainability. Rather, and as discussed, this thesis is concerned with sustainability in the context of delivering an infrastructure facility, namely in relation to the activities of the project proponent and its delivery partners, or the ‘project team’. This research is therefore positioned across all stages of project delivery (Figure 1) in recognition that any sustainability vision, values or objectives specified during planning need to be translated and integrated into other project delivery processes, as per the above definition of governing infrastructure sustainability. However, the critical importance of planning – including impact assessment – processes in the pursuit of sustainable development is recognised.\(^{75}\)

The importance of integrating infrastructure sustainability into project delivery processes is discussed by a number of commentators in the field. Vanegas states that ‘any process, practice, or operating procedure ... within the various phases of the project [including] the planning phase [and] the design phase ... provides an entry point for formal and explicit input of sustainability in any of its manifestations’.\(^{76}\) The idea of an ‘entry point’ is synonymous with the concept of integration. Vanegas also remarks that ‘the delivery and management systems for a ... project [should be] sensitive to sustainability and ... not inhibit its implementation in any way’.\(^{77}\) This highlights the importance of aligning project delivery processes with infrastructure sustainability and desired outcomes. Other commentators remark that any approach to infrastructure sustainability needs to be integrated with project

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\(^{74}\) Hacking and Guthrie, above n 72, 73; see in general Pope et al, ibid.

\(^{75}\) In addition, the relationship between impact assessment processes and an approach to governing infrastructure sustainability is discussed in the context of the case studies in Part III Section B(5) and Part IV Section B(5). See Section B below for an introduction to the case studies.

\(^{76}\) Vanegas, above n 15, 5368.

\(^{77}\) Ibid 5367.
delivery processes including design, construction and operation requirements.\textsuperscript{78} Ugwu et al present an infrastructure sustainability assessment tool to assess design options.\textsuperscript{79} In this article, the authors state that effective management processes are necessary for achieving infrastructure sustainability,\textsuperscript{80} but they do not provide details of what these management processes might look like.

Other articles hint at the importance of governing infrastructure sustainability, but do not discuss how it should be undertaken. Shen et al state that ‘a revolutionary solution is required to enable the integration of various methods and the working-together among all project participants’\textsuperscript{81} They try to provide a solution by establishing a sustainability performance checklist for considering infrastructure sustainability performance.\textsuperscript{82} The checklist includes a variation of the infrastructure sustainability categories outlined above. It then lists various recommendations and activities for achieving infrastructure sustainability under environmental, economic or social ‘factors’ for the different project stages.\textsuperscript{83} These stages are identified as inception, design, construction, operation and demolition in the article. Example includes ‘use of both renewable and non-renewable raw materials’ in the project operation stage under the environmental factor.\textsuperscript{84} However, they do not discuss how such a checklist will be effectively integrated into project delivery processes, or how it will be governed. Other articles present a similar issue.

In a recent article, Fernández-Sánchez and Rodríguez-López describe a methodological process to identify and select sustainability indicators by considering them as opportunities or ‘positive risks’ associated with a project.\textsuperscript{85} The authors then outline a process of prioritising indicators by selecting the most influential indicators, and discarding others.\textsuperscript{86} The influential indicators are grouped into categories or factors such as biodiversity and water.\textsuperscript{87} In their case

\textsuperscript{78} T G Carpenter, above n 2, 699.
\textsuperscript{80} Ugwu et al, ibid, 240.
\textsuperscript{81} Shen et al, above n 7, 274.
\textsuperscript{82} Ibid 274.
\textsuperscript{83} Ibid 274-278.
\textsuperscript{84} Ibid 278.
\textsuperscript{85} Fernández-Sánchez and Rodríguez-López, above n 60, 1194.
\textsuperscript{86} Ibid 1197.
\textsuperscript{87} Ibid 1198-99.
study where they prioritise indicators, project management and governance sits at number 18 in terms of importance ranking.\textsuperscript{88} Ideally, this theme (and its indicators) should be excluded from prioritisation because it is so fundamental to achieving sustainability outcomes. The authors of this article even state that there is a need to ‘establish a methodology for the identification of sustainability indicators from the project management point of view’,\textsuperscript{89} meaning indicators that could measure progress in integrating infrastructure sustainability into project management activities. However, there is a lack of detailed discussion on such indicators in this article. Further, the indicators in themselves would be unlikely to provide guidance on how to govern infrastructure sustainability.

Another article of relevance presents an infrastructure sustainability performance approach for supporting decision-making in selecting project options, using an example of a water main replacement project in Arizona where multiple options are available.\textsuperscript{90} In a later article, the same authors adapt the model to assess proposed design alternatives applicable to an underground infrastructure project.\textsuperscript{91} These articles focus on measurement of infrastructure sustainability, and more specifically on assessment of infrastructure project options based on sustainability criteria.\textsuperscript{92} These articles do not look at how to integrate key features of this approach with the management or overall governance of a project. Two other approaches developed in the literature include one comprising a series of checklists and guidelines to evaluate the social, economic and environmental sustainability of water and sanitation development projects,\textsuperscript{93} and an indicator framework for assessing sustainable infrastructure facilities.\textsuperscript{94} Again, these articles focus on assessment of options with limited guidance on how to integrate the approaches with the management or overall governance of a project.

Some commentators in the building sustainability research area acknowledge the need for guidance on the governance of sustainability in project delivery, suggesting that a key limitation with existing building sustainability performance assessment and rating tools is the

\textsuperscript{88} Ibid 1200.
\textsuperscript{89} Ibid 1200.
\textsuperscript{90} Koo and Ariaratnam, above n 15, 564.
\textsuperscript{91} Koo et al, above n 16, 766.
\textsuperscript{92} Koo and Ariaratnam, above n 15, 563.
lack of guidance on how to achieve sustainability outcomes. Although the commentators refer to sustainability performance assessment and rating tools explicitly, it still highlights a gap in the literature of guidance on achieving sustainability in project delivery processes. Building sustainability performance rating tools have also been viewed as mechanisms that add sustainability to existing project processes. It has been suggested that the addition of such mechanisms to existing processes is not enough to change the practice of industry toward sustainability, indicating the importance of integrating sustainability into project delivery processes, instead of having it as an ‘add-on’. Also, writing about sustainability in the construction industry, Demaid and Quintas remark that ‘knowledge about sustainability is yet to become embedded in project procedures ...

As stated above, recently the infrastructure industry, particularly in Australia and the UK, has been active in developing sustainability performance rating tools. Rating tools, which aim to publicly recognise infrastructure sustainability, include CEEQUAL – operational in the UK since 2003 and now available for use internationally, VicRoads’ INVEST released in 2010, and the aforementioned AGIC scheme currently in the final stages of development. The U.S Institute for Sustainable Infrastructure has also developed a rating tool called the Envision Rating System. Such rating tools are generally adopted voluntarily by proponents and their delivery partners. There are also various consultancy tools for infrastructure sustainability, including ARUP’s SPeAR®, Worley Parsons’ EcoNomics™ and GHD’s Sustainability Protocol. Information on these tools is limited, largely due to intellectual property protection issues.

In relation to governing infrastructure sustainability, FIDIC’s Project Sustainability Management Guidelines from 2004 provide some guidance, but the guidelines are quite theoretical and high-level, and there is insufficient detail on how the recommended process can be integrated with project delivery processes. For example, FIDIC discusses that the Guidelines operate ‘in parallel [emphasis added] with the established areas of cost, time,
Part I Section A

scope, human resources, risk, procurement, communications and quality management’. 99

FIDIC’s tool is also limited because no working examples of its application on real-life infrastructure projects could be found. Further, it is based on a set of indicators for measuring progress toward a set of generic sustainability goals (albeit that they are said to be customisable), 100 and focuses on the role of consulting engineers in this capacity. 101 The focus on indicators is problematic because again there is limited guidance on how to achieve the performance that the indicators aim to measure.

As AGIC’s tool was still under development when this research was undertaken, 102 including the governance theme and its categories, guidance from AGIC on effective infrastructure sustainability governance is limited. In addition, sustainability performance rating tools, such as CEEQUAL, are generally retrospective. They reward infrastructure sustainability after the fact; they are not tools for structuring an approach to governing infrastructure sustainability per se, although they may provide some guidance based on the assessment questions and their supporting information. 103

In theory, EMS is a tool for governing the environmental dimension of sustainability, including during project delivery. There is, however, some literature on the potential to expand EMS to incorporate social and economic dimensions in the form of a sustainability management system, 104 yet this notion is still in its infancy. Further, the majority of the literature focuses on doing so within organisations not directly involved in infrastructure project delivery 105 or within operators of infrastructure facilities. 106 An issue with adapting EMS to include sustainability dimensions is that the resulted sustainability management system may confront similar constraints to that of an EMS. Such constraints are discussed in

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99 FIDIC, above n 34, 8.
100 Ibid, 4.
101 Ibid, 9 and 10.
102 The tool is currently in its pilot phase. See <www.agic.net.au>.
103 See in general CEEQUAL, above n 38. See Part IV Section B(9) and Part V Section B(8) for further discussion.
105 See for example Emilsson and Hjelm, ibid and Palframan et al, ibid.
the literature and include perceived and actual costs of implementing an EMS, and underestimated benefits, as well as impracticalities in adapting ISO 14001 requirements into practice. In addition, adapting EMS to incorporate other sustainability dimensions may be inappropriate because the focus on managing environmental impacts may be lost to social – but more likely economic – imperatives. In addition, stakeholders to the management system may continue to perceive it as an environmental management tool, as opposed to a tool that also covers social and economic issues. This may have negative consequences for its implementation.

EMS is also typically focused on construction environmental management in terms of the project delivery phase, which is only part of the scope of this thesis. Further, it has been criticised in its lack of integration and linkage with early planning – including impact assessment – activities. This is due in part to the predominant use of EMS as an environmental management tool during the construction stage, and then during the operational phase, rather than at earlier project delivery stages. These issues indicate that an in-depth examination of EMS in the context of this research topic would be insufficient. However, the underlying principles of EMS are discussed in later parts of this thesis as they relate to the research questions.

The issue or topic of governing infrastructure sustainability is therefore very underdeveloped and underexplored in academic research and in the industry domain. However, there is some publicly available information indicating that some project proponents and their delivery partners are developing and implementing approaches to governing infrastructure sustainability. Information largely comprises material found on the websites of the proponents and their project delivery partners.

109 This has been an argument against adapting environmental impact assessment to include social and economic considerations under the ‘banner’ of sustainability. See Part IV Section B(3).
111 See for example infrastructure sustainability work undertaken by the consultancy GHD for the East Perth Redevelopment Authority <www.ghd.com/enews/sustainability/oct06/project3.htm> at 23 May 2011; and URS,
Given that these project-specific approaches exist, but there is limited publicly available information on them, this thesis adopts case study methodology to explore the concept of governing infrastructure sustainability. Two case studies were selected and the respective approaches to governing infrastructure sustainability explored. This includes key challenges associated with the implementation of each case study approach, and how these challenges were overcome. Based on this analysis, a framework for governing infrastructure sustainability is developed. These research objectives and an overview of the methodology are discussed further in the proceeding section.
B Methodology Overview, Objectives and Scope

1 Methodology Overview

The preceding section highlighted the importance of governing infrastructure sustainability, and that guidance for this aspect of infrastructure sustainability is in its infancy both in the academic and industry realms. Investigating the research topic through actual project examples, or case studies, is appropriate because the research topic is so contextual to the realities of infrastructure project delivery, and because there is some evidence in the public domain that infrastructure proponents and their delivery partners are developing and implementing infrastructure sustainability governance approaches.

At the early stages of this research project, the author worked as a consultant offering advice on infrastructure sustainability to infrastructure proponents and their delivery partners. The engagement was primarily by urban passenger rail (urban rail) infrastructure proponents and their delivery partners in Queensland and New South Wales (NSW), Australia. Urban rail projects can be separated into heavy rail, light rail, high-speed rail and metro rail projects.112 A web-based search on urban rail projects globally revealed that there was increasing investment in urban rail infrastructure projects. In 2009, the UK Government stated that urban rail journeys were preferred to plane trips for domestic travel, planning to reduce domestic air travel through ‘an explicit policy target … aiming to replace short-haul flights with a new … high-speed rail network’.113 In 2009 in the United States, developing a nationwide high-speed rail network was considered a priority of Federal Government funding.114

In Australia, the Federal Government assigned a significant proportion of 2009/2010 Federal Budget to urban rail projects. In NSW, the Sydney Metro project received $91 million for the pre-construction phase of the West Metro component; the Regional Rail Link in Victoria received $3.23 billion, the largest amount of Federal funding out of an entire priority list of critical projects; while the Queensland Gold Coast’s light rail project received $365 million. Interestingly, of the fifteen transport infrastructure projects receiving Australian Federal funding in the 2009/2010 Federal Budget, nine were new or upgrading existing rail infrastructure projects. In addition, urban rail projects, and particularly metro systems, are often pre-requisites to a city being considered ‘world class’, such as the metro systems in New York City, Copenhagen, Tokyo and Paris. This interest and activity in the development of urban rail projects supported the investigation of this research topic through an urban rail infrastructure project ‘lens’. Based on these considerations and findings, case studies from the urban rail sector were sought.

The selection protocol for the case studies comprised: i) there was some indication that the project proponent and/or delivery partners were developing or implementing an approach to governing infrastructure sustainability, ii) the projects involved were recent projects so that contemporary practice could be investigated, and iii) the project proponent and/or delivery partners were involved in delivering urban rail projects. To increase the likelihood of finding case studies that fit the selection protocol criteria, an informal interview process was conducted with individuals working within the urban rail sector in Sydney, selected based on the author’s existing networks within the industry. Twenty three individuals were interviewed between June and November 2009 (‘round one’ of interviews). Participants comprised individuals working in legal firms or organisations and a NSW environmental regulatory authority, sustainability consultants, environmental consultants, project managers,


117 The author has worked in the infrastructure industry in Sydney for over seven years and was therefore able to utilise existing contacts. The ethics approval number for these interviews is H7609.
Part I Section B

construction environmental managers, and individuals working in a sustainability managerial role in the two main urban rail government bodies operating in Sydney (Appendix I Section A).

Infrastructure sustainability as a concept was discussed during these interviews. The interviewees were also asked to recommend urban rail infrastructure projects at an international scale that they believed were demonstrating progress in infrastructure sustainability. Confining the first round of interviews to NSW was believed to be adequate in selecting a case study from Sydney particularly, but also nation-wide and internationally, because many infrastructure professionals have experience working at an international scale. Further, many organisations, particularly consultancies, have a national and international presence. The suggestions were verified using a web-based search for information on each project and project organisation and its associated infrastructure sustainability and outcomes.

The case studies selected based on the outcomes of the interview process and the web-based search are the Sydney Metro Authority’s (SMA) Sydney Metro project and the London 2012 Olympic Delivery Authority’s transport division (ODAT). The backgrounds to these projects are discussed in Part II Sections B and C respectively. The Sydney Metro project was deferred by the NSW Government in February 2010. The project was carried through as a case study because it is well regarded by industry professionals, as deduced from the ‘round one’ interview process and the author’s practical experience, that it was a benchmark project internationally in various aspects of governing infrastructure sustainability. This was confirmed by a colleague of the author who was seconded onto the Sydney Metro project as the sustainability manager, to help set up the structure for governing infrastructure sustainability. Thus, despite the fact that the Sydney Metro project was deferred, there are lessons to be learnt and experiences to be investigated.

The second case study of ODAT was selected based on interviewee responses. One interviewee remarked that ‘if you look at an Olympic related rail project, it probably will be best practice, simply because the whole ethos of the organisation [the Olympic Delivery Authority] is excellent’. Further review of ODAT’s urban rail projects and associated infrastructure sustainability using a web-based search confirmed its suitability as a case study

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118 Interviewee C1; See Appendix I for interviewee coding.
organisation. One urban rail project in particular stood out as making ODAT a good case study. The Orient Way rail sidings project received an ‘excellent’ CEEQUAL rating, mainly for its positive environmental outcomes. Despite there not being a significant focus on social outcomes, Orient Way was seen as a good project example of how ODAT’s approach to governing infrastructure sustainability worked ‘on the ground’. ODAT is responsible for delivering a number of new or upgraded rail projects as part of the 2012 Olympic Games. The case study methodology is discussed further in Part II Section A.

SMA and ODAT and the respective projects had similarities making them suitable for a comparative study. Both SMA and ODAT were involved in transformational projects in terms of scale and how they would have, or are set to, change the respective cities. Both were new organisations set up specifically to deliver the project programs, and appear to have been of a similar size in terms of number of employees.

As will be discussed further in Part II Section A, qualitative research methods including the use of case studies are being increasingly favoured in the building sustainability research area for addressing complex project delivery and sustainability issues that conventional quantitative methods cannot adequately address on their own. Using case study methodology also overcomes issues of incomplete access to data faced by researchers of sustainability in the context of project delivery.

2 Research Objectives and Scope

As stated, this thesis explores the case study approaches to governing infrastructure sustainability. There are three specific research questions associated with this exploration. The key output of this research is a framework for governing infrastructure sustainability. As stated, this exploration into governing infrastructure sustainability is being carried out through an urban rail infrastructure project ‘lens’.

The first research question is: what have been the key internal and external drivers for addressing, and thereafter developing an approach to governing, infrastructure sustainability

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119 See Part III Section A and Part IV Section A for further discussion.
121 Klotz and Horman, above n 71, 595.
within each case study? This question aims to enable a better understanding of why the case study organisations considered adopting an infrastructure sustainability agenda to begin with. This is important because it sets the context for the applicability of the research findings – and theory developed based on the research findings – to other projects. Similar drivers would need to exist for other project delivery organisations to be inclined to address infrastructure sustainability and hence develop an approach to governing infrastructure sustainability.

This research question is dealt with through exploration of these drivers for each case study using the case study methodology presented in Part II Section A. Each case study Part includes, as Section A, a discussion of the key internal and external drivers for addressing infrastructure sustainability. A discussion of these drivers, including in a comparative sense between the two case studies, is used to inform assumptions about the applicability of the research findings to other projects in Part VI of this thesis.

The second research question is: how did each case study organisation govern infrastructure sustainability? As discussed, both case studies appeared to demonstrate exemplary infrastructure sustainability and/or outcomes. This research question aims to reveal how each organisation achieved this practice and/or outcomes. To achieve this aim, each case study approach to governing infrastructure sustainability as it is defined above needs to be explored. Theory can then be developed on the most appropriate way to govern infrastructure sustainability based on the case study research findings. This research question is dealt with using the case study methodology described in Part II Section A.

The third and final research question is: what have been the key challenges to addressing infrastructure sustainability – and more specifically, developing and implementing the approach – and how have these challenges been overcome? This research question gives more context to the application of each approach in practice, especially with respect to issues associated with making the approaches ‘work’ in reality. This helps to ensure the research findings and the subsequent framework are grounded in the realities of project delivery, making the research findings more applicable to the ‘real world’ (see Section C below). Again, this research question is dealt with using the case study methodology described in Part II Section A.
Part I Section C

The scope of the investigation falls within the parameters of the two case studies or the case study units. However, boundaries need to be established to ensure case study research is manageable and meaningful.\footnote{Pamela Baxter and Susan Jack, 'Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers' (2008) 13(4) The Qualitative Report 544, 546.} The scope of the case studies is discussed in Part II, which provides further detail on the methodology and background to the case studies. It is worth noting that the definition of governing infrastructure sustainability outlined above helped to define these boundaries.

In terms of where this research ‘sits’ in the project development and delivery phases as per Figure 1, it is positioned after pre-feasibility and concept. The research comes in at planning and feasibility where the preferred option is refined through design and other activities. This is to ensure that the research task is manageable and can be focused. It would be unmanageable to explore every phase and its interface with sustainability or infrastructure sustainability governance. Also, for both case study organisations, the projects were at the delivery phase when the research was being conducted, and hence information was more readily available. However, as acknowledged above, the project development phase, and more specifically the type of facility or project selected to address an infrastructure ‘need’, has the greatest potential to influence sustainability outcomes.

C Justification and Contribution

The preceding sections highlighted the importance of governing infrastructure sustainability and that guidance is in its infancy both in the academic and industry realms. There are a number of infrastructure sustainability performance rating tools but typically they lack guidance on how to govern infrastructure sustainability. Considering these issues and findings, this thesis contributes in a number of ways.

This thesis will help to fill the gap that exists in the academic realm on guidance to effectively govern infrastructure sustainability. It will also add to the knowledge base of industry, providing insight into best practice industry activity in relation to the research topic.
Part I Section C

It is able to present and reflect on best practice activity because it is grounded in the realities of infrastructure projects due to the case study methodology.

The research findings and framework developed in this thesis have already been used in the development of the governance theme of AGIC’s rating tool. Specifically, the author has applied the research findings in her role as peer reviewer of theme 1 of the pilot version of the tool. The author was elected into this role in early 2011 by AGIC primarily in recognition of the timeliness and relevance of this research. This demonstrates the practical applicability of the research findings – although issues associated with making generalisations based on two case studies alone are recognised and discussed in Part II Section A in the context of the methodology, and in Part VI Section A in the context of the applicability of the framework. The findings of this research are likely transferrable to other infrastructure sustainability-rating tools which, as learnt from the CEEQUAL experience, are being constantly updated.

The potential audience of this thesis is therefore diverse and includes i) sustainability consultants or advisers, and other relevant professionals operating in the infrastructure sustainability ‘space’, ii) proponents and industry associations including AGIC, and iii) academic institutions researching in disciplines such as sustainability, engineering, project management and construction management.

Sustainability advisers and other relevant professionals can adapt the framework presented in Part VI to infrastructure projects in which they are involved. Some aspects of the framework presented in Part VI are already being adapted into an infrastructure sustainability approach being developed by the consultancy with which the author works. The research methods employed therefore aim to result in a coupling of research and practice – whereby the framework for governing infrastructure sustainability can address the actual needs and

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123 Theme 1 is separated into 1.1 purchasing and procurement, 1.2 management systems and 1.3 decision-making. See the Australian Green Infrastructure Council, above n 60. The pilot version of AGIC’s tool was released in August 2011, and can be found at <www.agic.net.au>. The final version of the tool is due for release in early 2012.

124 CEEQUAL is updated on a regular basis. Since 2003 there have been 4 versions, and there are regular updates for specific components of the tool.

125 For the purposes of this thesis, the sustainability advisory profession is a professional service that offers advice on infrastructure sustainability to proponents and their delivery partners. In Australia, the number of individuals and companies claiming to offer such services are increasing. See for example Net Balance at <www.netbalance.com/>, URS at <www.ap.urscorp.com/AboutURS/3iSustainability/> and GHD <www.ghd.com/enews/sustainability/oct06/ourteam.htm>. 
interests of infrastructure professionals. In terms of industry practice, the ultimate goal of this thesis is therefore to contribute to a ‘step change’ within industry in infrastructure sustainability.

D Thesis Structure

This thesis is divided into six more parts. Part II expands on the methodology used to fulfil the objectives of the thesis, namely the qualitative case study method. Part II then provides the background to the two case studies – SMA and ODAT. Part III details the SMA case study, separated into the internal and external drivers for addressing and governing infrastructure sustainability, followed by details of the approach to governing infrastructure sustainability adopted by SMA, and the key challenges to implementing this approach and how they were overcome. The key findings are then summarised. The ODAT case study is provided in Part IV, with information presented in a similar manner to the SMA case study. Part V then embarks on a comparative study of the two case studies, comparing and contrasting the different approaches, and highlighting the differences and similarities to help validate and check theory developed. Part VI presents a framework for governing infrastructure sustainability based on the theory developed in the preceding parts. Part VII concludes with recommendations for further research.

II METHODOLOGY AND BACKGROUND TO CASE STUDIES

A Methodology

1 Overview

The case studies SMA (Sydney Metro Authority) and ODAT (Olympic Delivery Authority (transport division)) were selected based on an interview process and web-based search that confirmed their consistency with the selection protocol.127 This section provides more detail on the methodology used to address the research questions and objectives. It defines qualitative research methods and case study research. This section then provides details of the data collection and analytical process, and discusses limitations and assumptions. The following two Sections B and C provide the background to the case study organisations and projects. Those sections provide the necessary context for the case study analysis and discussion in the proceeding parts.

2 Qualitative Research

Case study research is a qualitative research method. Qualitative research is defined by Strauss and Corbin as ‘any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification’.128 Qualitative research includes findings derived from data gathered from observations, interactions and materials such as documents.129 According to Creswell, in qualitative research the researcher builds a complex and holistic picture, analyses words and reports detailed views of informants.130 Qualitative research is suited to new research topics, or topics where not all concepts pertaining to the research topic have been identified or are clearly understood.131 Qualitative research is suited

127 See Part I Section B(1).
129 Ibid 18.
131 Strauss and Corbin, above n 128, 19 and 37.
to this research topic because, as discussed in Part I Section A(3), the research area is conceptually underdeveloped and underexplored, with limited literature available.

In addition, some commentators discuss the need for qualitative methodologies to complement the use of more traditional quantitative research methods, such as experimental design, that have dominated the construction-related research community in relation to complex phenomena. They suggest that qualitative research can more readily facilitate understanding of complex issues and interactions present on construction projects than quantitative methods. This has implications for designing research methods to examine infrastructure sustainability. Infrastructure sustainability is an inherently complex, multi-disciplinary topic that is connected to an array of project delivery processes and systems, as outlined in Part I Section A. While quantitative research methods may be suitable for examining one aspect of environmental, social and economic project performance – for example the environmental performance of construction materials – infrastructure sustainability is suited to qualitative research methods that allow for complex inter-linkages and processes to be better understood.

3 Case Study Design

Yin defines case study research as ‘an empirical inquiry that investigates a contemporary phenomenon within its real-life context’. Applying case study research methods to this research topic is suitable because it is a contemporary phenomena situated within a context – the real-life context of delivering an infrastructure project – where behaviours cannot be manipulated.

A case study itself is defined by Miles and Huberman as ‘a phenomenon of some sort occurring in a bounded context’. This thesis uses multiple cases studies in that it uses two

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132 Phelps and Horman, above n 120, 58; Klotz and Horman, above n 71, 595.
133 Phelps and Horman, ibid 62.
134 This is discussed as important by Yin in Robert K Yin, Case Study Research – Design and Methods (Sage Publications, 3rd ed, 2003) 13.
135 Ibid 7.
The multiple case design permits the researcher to make generalisations based on observations of patterns or replications among the cases, and the evidence created from multiple case studies is considered to be robust and reliable. Tellis states that ‘multiple cases strengthen the results by replicating the pattern-matching, thus increasing confidence in the robustness of the theory’. However, given that only two case studies have been used, namely due to time and resource limitations, it is more appropriate to concede that two case studies can allow comparisons, which can form a valid and valuable basis for further work leading to generalisations. It is inappropriate to argue that theory emerging from the two case studies is in itself suitable to make industry generalisations. The implications of this for the framework presented in Part VI is further discussed in that part. Recommendations for further work to advance theory resulting from the two case studies so that generalisations can be made are discussed in Part VII.

The boundary for each case study was established in part through the identification of where the research is positioned – that is at the stages of feasibility and planning through to construction and commissioning (see Figure 1). Consequently, data that related to these delivery stages was sought, and data relating to project development, such as business case or government planning documents, was excluded.

To a certain extent, the definition of governing infrastructure sustainability influenced the selection of project employees to be included in the study through the interview process, and the determination of what other data sources were needed. Other interviewees were selected opportunistically, as discussed below. Details of each case study including organisation and project-specifics are found in Sections B and C below. These sections set the scene, as well as the boundaries, for the case studies.

Although there is variation in the case studies themselves in terms of organisation and project-specifics such as delivery method, the same research design is applied to both.

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137 Multiple case studies are two or more case studies, rather than a singular case study, Winston Tellis, ‘Introduction to Case Study’ (1997) 3(2) The Qualitative Report at <www.nova.edu/ssss/QR/QR3-2/tellis1.html> at 3 April 2011.
138 Baxter and Jack above n 123, 550.
139 Tellis, above n 137.
140 Baxter and Jack, above n 122, 553.
SMA and ODAT are what Yin calls ‘literal replications’ in that they are both believed to demonstrate exemplary outcomes in relation to the research topic.\textsuperscript{142}

(a) Interviews

Conducting interviews is an important part of case study research.\textsuperscript{143} Interviews were important for gathering case study data on the research topic because limited information is publicly available. The knowledge is held by project employees, as well as in internal, confidential documents, which were more easily accessed by forming relationships with employees through interviews. Interviewing permits an in-depth exploration of the knowledge and experience held by the project employees on the research topic.\textsuperscript{144} How confidential documents are used in this thesis is outlined in the next section. The case study interviews process was separate to the ‘round one’ of interviews outlined in Part I Section B.

The number and types of interviewees for each case study was determined through a selection protocol in the first instance. The selection protocol was designed to incorporate individuals who had knowledge and experience which would help address the research questions and objectives. The selection protocol included that potential interview participants i) had to have been an employee of SMA or ODAT, ii) had to have been involved in the delivery of the respective projects in a tangible way, for example in setting regulatory requirements or as a contractor, and iii) in some way had to have been involved in the approach to governing infrastructure sustainability.

At the time interviewees were being sought, the author did not have a clear understanding of what each governance approach looked like, and how it interfaced with various disciplines, so that appropriate interviewees could be selected. The sustainability advisers were therefore targeted in the first instance. Interviews were then largely opportunistic in that interviewees were not initially selected by the author but were recommended by other project team members and were willing to be interviewed. The final interview question in the pro-forma (Appendix I) required the interviewee to recommend other potential research participants.

\textsuperscript{142} Ibid 59.
\textsuperscript{143} Yin, above n 134, 11.
\textsuperscript{144} Kathy Charmaz, Constructing Grounded Theory – A Practical Guide through Qualitative Analysis (Sage Publications, 2006) 25.
The grouping of interviewees as per Table 1 was undertaken post interviews, and followed the normal grouping of disciplines involved in infrastructure project delivery.

The SMA interviews were conducted prior to the ODAT interviews. Therefore, based on the grouping of the SMA interviews, the author tried to source complementary interviewees in ODAT for ease of comparison between the two case studies. Two interviewees from the sustainability discipline who were employed within ODA, as opposed to ODAT, were selected to gain a better understanding of the interface and relationship between ODA and ODAT’s infrastructure sustainability governance approach. This is explained further in Section 5 below.

**TABLE 1** – Grouping of interview participants including code (see further detail on coding protocol in Appendix I), and description of each group

<table>
<thead>
<tr>
<th>GROUP NAME</th>
<th>CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment &amp; Planning discipline</td>
<td>E</td>
<td>• Develop environmental management and compliance systems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Respond to regulatory requirements and planning conditions set by regulators.</td>
</tr>
<tr>
<td>Sustainability advisory discipline</td>
<td>S</td>
<td>• Develop and implement governing infrastructure sustainability approach.</td>
</tr>
<tr>
<td>Design discipline</td>
<td>D</td>
<td>• Involved in design processes for the project.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Includes architects, civil engineers and electrical engineers.</td>
</tr>
<tr>
<td>Leadership level</td>
<td>L</td>
<td>• Level of high authority on a project, for example in a project director, general manager or board role.</td>
</tr>
<tr>
<td>Regulators</td>
<td>R</td>
<td>• Environmental regulatory bodies that set regulatory requirements and planning conditions for the projects.</td>
</tr>
</tbody>
</table>

A total of 21 interviews were conducted in person between November 2009 and August 2010. The number of interviewees in each group for each case study is tabulated in Appendix I. Names of interviewees quoted in this thesis have been excluded for privacy reasons, but a coding system indicating the case study, followed by interview group, and then a number, is provided to ensure the quotes are meaningful in the context of the discussion. The coding protocol is also tabulated in Appendix I.
The interviews were semi-structured and took between one and two hours. The questions asked of the participants were open-ended (see Appendix I) but related to the concept of governing infrastructure sustainability. The interviews were recorded and qualitative data analysis software, namely ATLAS.ti, was used to sort and analyse the data. Section 4 below provides further information on the data analysis process. Quotes taken from the interviews are used to highlight and support the discussion.

(b) Other Data Sources

Data was not only gathered from interviews, but also from reports and other project and organisational-related materials relevant to the research topic.\(^\text{145}\) These reports and materials included internal sustainability reports, request for proposal (RFP) documentation, environmental assessment reports, presentations, working group meeting minutes and other data sources relating to the research topic. Moreover, the author received various confidential documents relevant to the research questions that often could not be reported in the thesis. However, they were used to help develop an understanding of the case study organisations and the respective projects.

4 Data Analysis

The research questions suit an inductive approach to data analysis found in the grounded theory research method. Grounded theory is a qualitative research method that emerged from two sociologists Barney G Glaser and Anslem L Strauss in the 1960s. Grounded theory concerns collecting and analysing qualitative data to construct theories ‘grounded’ in the data.\(^\text{146}\) In grounded theory, codes are created by what is seen in the data. Coding is the pivotal link between collecting data and developing theory to explain data.\(^\text{147}\) This is an inductive approach, as oppose to a deductive approach where preconceived coding constructs are applied.

This research followed the grounded theory approach of i) initial coding of naming segments of the data, and ii) focused coding where significant initial codes were used as categories to

\(^\text{145}\) Strauss and Corbin, above n 128, 39.  
\(^\text{146}\) Charmaz, above n 144, 2.  
\(^\text{147}\) Ibid 46.
sort, synthesise and integrate large amounts of data.\textsuperscript{148} In the initial coding phase, ideas emerged that were then pursued by further data collection and analysis. In the focused coding phase, data was compared and contrasted with each other and with the initial codes to develop more focused codes, or ‘categories’. Sub-categories were also developed within each category, and axial coding was undertaken whereby links and relationships between categories and sub-categories were explored to form more complete ideas and explanations.\textsuperscript{149}

These categories, sub-categories and links became flexible guidelines through which data was explored, interpreted and theory was developed\textsuperscript{150} in response to the research questions and objectives. The categories and sub-categories generally sit as key headings and sub-headings within each case study (Parts III and IV), such as ‘decision-support tools’ under which includes ‘sustainability assessment performance tools’; and ‘roles and responsibilities’ under which includes ‘organisational structure for sustainability’.\textsuperscript{151}

As SMA was the first case study investigated by the author, SMA categories and sub-categories influenced data collection and analysis methods for the ODAT case study. These categories and sub-categories serve in facilitating the comparative study (see below and Part V). However, in some instances there was not a neat ‘fit’ between the data collected and the categories and sub-categories developed based on the SMA case study. The author refrained from trying to ‘force’ the data into these existing categories and sub-categories, and new sub-categories in particular were developed from the ODAT case study data where necessary. The author acknowledged that forcing the data may have resulted in important differences between the two case studies going unnoticed. Comparing such differences forms a part of the comparative study (Part V). And further, understanding such differences was imperative in appreciating to what extent the research findings are transferable to other urban rail infrastructure projects, or more specifically, in evaluating the applicability of the framework presented in Part VI.\textsuperscript{152}

\textsuperscript{148} Ibid.
\textsuperscript{149} Strauss and Corbin, above n 128, 124.
\textsuperscript{150} Charmaz, above n 144, 61.
\textsuperscript{151} For example see Part III Sections B(10) and 9 respectively.
\textsuperscript{152} See Part VI Section A.
Theory was then developed through the inductive theory building method used for each case study, and further through a comparative study between the two case studies. The comparative study, found in Part V, compares and contrasts the case studies, and highlights the differences and similarities to help validate and check theory developed. The comparative study assists in building theory around the most suitable way to govern infrastructure sustainability, as specific components in one approach are used to support, challenge, inform or add value to components in the other. The framework for governing infrastructure sustainability is developed based on this theory, and is presented in Part VI.

The ODAT case study complements the SMA case study in the comparative study because the Sydney Metro project was deferred at a relatively early stage of project delivery. Therefore some valuable lessons that could not be learnt from SMA can be taken from ODAT, for example in relation to addressing infrastructure sustainability during construction.\textsuperscript{153}

An important process in data analysis is undertaking verification through data triangulation. Data triangulation helps to ensure the data collected is accurate and meaningful.\textsuperscript{154} Creswell outlines a number of strategies for validating data and theory constructs.\textsuperscript{155} In this thesis, two methods are used: i) using different data sources of interviews, reports and other materials as per above, and ii) corroboration of findings from different interviewees.\textsuperscript{156} Corroboration of findings occurred when a minimum of two sources described the same issue on the same case study in a similar manner.\textsuperscript{157}

5 Limitations and Assumptions

Ideally, case study research involves the use of direct observation, for example facilitated through a field visit.\textsuperscript{158} However, direct observation was limited given the confidential nature of the case study organisations. Confidentiality issues also gave rise to limitations associated with data collection, namely the ability to view internal documents such as reports and other

\textsuperscript{153} See Part IV Section B(7).
\textsuperscript{154} Phelps and Horman, above n 120, 61.
\textsuperscript{156} Baxter and Jack, above n 122, 556.
\textsuperscript{157} An approach adopted by Magent et al above n 95, 71.
\textsuperscript{158} Tellis, above n 137.
materials, and the ability to observe sustainability-related workshops and meetings. This made interviews the best form of data collection for the case studies, and an interview coding protocol that ensures anonymity to encourage openness and transparency is favourable (Appendix I Section A). This is the main reason that focus group interviews were avoided, as some participants may have been reluctant to share information publicly as per the focus group format.\footnote{A focus group is a social research tool and is a type of group interview. Further information can be found in Nancy Grudens-Schuck et al ‘Focus Group Fundamentals – Methodology Brief’ (Report, Iowa State University, date unknown) <www.extension.iastate.edu/publications/pm1969b.pdf> 23 June 2011} Many of the transparent and seemingly honest answers appearing in the data collected during the interviews were likely shared with the author because of the guarantee that anonymity would be upheld in the research process.

Another limitation relates to the interviewee selection process. The desired interviewees were not always available or keen to be interviewed. This was particularly an issue with the regulators. Where possible, these interviewees were replaced with others in a similar position. In addition, as outlined above, interviewees were often selected opportunistically, in addition to being selected based on the interview protocol. This means that there is a chance that some of the data is skewed because those individuals that likely have an interest in sustainability were the main sources of interview data – in that they were interested in the research and consequently were keen to be interviewed. It may have been favourable to interview those individuals that were not interested or were not ‘believers’ in sustainability. This may have produced some different perspectives and challenged some underlying assumptions about infrastructure sustainability as a concept. At the same time, however, it is unlikely that such individuals would have been interested in participating in the research. And in a few instances, the author found that that was the case.

A final limitation is that data relating to ODA as opposed to specifically relating to ODAT is sometimes used in the analysis. This is because in some instances the data collected specifically on ODAT simply did not provide insight into a few of the key categories and sub-categories resulting from the SMA case study. So while the author was careful not to ‘force’ ODAT data into SMA categories and sub-categories, further information on some categories and sub-categories was needed to facilitate the comparative study.
In attempting to find data on these ‘missing’ categories and sub-categories from ODAT interviewees and other data sources, the author was directed toward ODA to better understand how certain categories and sub-categories were dealt with. Specifically, two sustainability discipline interviewees from ODA (namely interviewees OS2 and OS3, see Appendix I) were interviewed for the purposes of gathering data about i) the interface between infrastructure sustainability and planning approval processes, and ii) sustainability advisers roles, responsibility and attributes. The reliance on information from ODA in these few instances is considered appropriate because ODAT’s approach to governing infrastructure sustainability is inherently linked to ODA – albeit that ODAT operates rather autonomously from ODA.

A key assumption in this thesis relates to the framework for governing infrastructure sustainability presented in Part VI. This framework assumes that appetite (or desire) for infrastructure sustainability exists whereby resources are made available for infrastructure sustainability. For example, it is assumed that the proponent organisation has – or is at least planning to – engage sustainability advisers on the project in question. However, the framework could also be used by sustainability advisers who are pitching for infrastructure sustainability work. The utility of the framework is discussed in Part I Section C in the context of contributions made by this thesis. Drivers for addressing and governing infrastructure sustainability in the context of the two case studies are discussed in Part III Section A and Part IV Section A.

B Background – Sydney Metro Authority

1 Project Overview

This section provides details of the organisation of SMA and the project program. It sets the scene, as well as the boundaries, for the SMA case study found in Part III. This section does

160 See Part IV Sections B(5) and (9) respectively.
161 See Section C below. The connection between ODA’s sustainability agenda and ODAT is discussed in Part IV Section B(2).
not include any analysis regarding SMA in the context of the research questions and objectives.

In October 2008, the New South Wales (NSW) Government and the then NSW Premier Nathan Rees announced that it would build a metro railway network for Sydney. Key objectives of the network included to serve and stimulate population and employment growth around key transport centres and corridors, promote urban renewal, reduce road congestion and ensure economic prosperity.\textsuperscript{162} Metro rail is defined in the New South Wales (NSW) Transport Administration Amendment (Metro Rail) Act 2008 as ‘a guided system designed to transport passengers on a railway track ... that provides high-frequency commuter and other passenger services ...’\textsuperscript{163} It includes ‘stations, platforms, maintenance facilities, depots and other transport interchanges, works, structures and facilities associated with or incidental to the metro railway or rail infrastructure facilities ...’\textsuperscript{164}

Three stages were proposed for the Sydney metro network:\textsuperscript{165}

- The CBD Metro – a new rail corridor through Sydney’s Central Business District (CBD) from Central Station to Rozelle.
- The West Metro – reaching from Westmead to Central Station via Parramatta, Sydney Olympic Park and the Inner West.
- The North West Metro – following the Victoria Road corridor from Rozelle to Macquarie Park and linking to a potential future rail corridor to the North West Growth Centre\textsuperscript{166} from Epping.

The CBD Metro was to be a seven-kilometre metro railway from Rozelle to Central, with new stations at Rozelle, Pyrmont, Barangaroo-Wynyard, Martin Place, Town Hall Square and

\textsuperscript{163} Transport Administration Amendment (Metro Rail) Act 2008 (NSW) sch 2 s 3(1)(a).
\textsuperscript{164} Ibid sch 2 s 3(1)(b).
\textsuperscript{165} A geographical map of these stages can be found in Appendix II Figure 12.
\textsuperscript{166} The North West Growth Centre is within the boundaries of three local government areas – The Hills, Blacktown and Hawkesbury. The Growth Centre is approximately 10,000 hectares and will contain about 70,000 new dwellings for 200,000 people. NSW Government Department of Planning, North West Growth Centre <www.gcc.nsw.gov.au/north-west-21.html> at 30 September 2010.
Central.\textsuperscript{167} The provision of infrastructure at White Bay was to allow for a future station in this location. Construction was proposed to commence in 2010 and the entire CBD Metro was planned to be operational by the end of 2015\textsuperscript{168} at an approximate cost of $5.3 billion.\textsuperscript{169} The West Metro was to consist of a twin-track passenger metro railway, 24.1 kilometres in length extending from the CBD Metro station at Central to Westmead, with eleven stations at an approximate cost of $8 billion.\textsuperscript{170} As the first extension of the CBD Metro, the West Metro was to create a continuous metro line extending from Westmead via Parramatta, the inner west, Central, and the Sydney CBD to Rozelle (Appendix II).\textsuperscript{171} Construction of the West Metro was proposed to commence in 2011 with trains operating on the line by the end of 2017.\textsuperscript{172} The North West Metro was to be developed following completion of the other stages, albeit that it was actually the first metro project investigated and announced by the NSW Government in March 2008.\textsuperscript{173} From hereon, these different stages are collectively known as the Sydney Metro project.

2 The Sydney Metro Authority

The proponent for the project was SMA, established in January 2009. SMA was a NSW Government agency constituted under the NSW Transport Administration Act 1988 as amended by the NSW Transport Administration Amendment (Metro Rail) Act 2008 to develop a metro railway network. The principal function of SMA was to develop safe and reliable metro railway network for Sydney. It was the governing body responsible for managing the delivery and commissioning of the CBD Metro by 2015, managing the development of other metro lines as part of a wider network, oversight of ongoing Metro operations including dictating service delivery and standards to any private operator, and the


\textsuperscript{168} Ibid.


\textsuperscript{170} West, (1\textsuperscript{st} article) ibid.

\textsuperscript{171} Sydney Metro Authority, above n 162, 3.

\textsuperscript{172} Ibid 5.

preparation of station plans for the purpose of developing a metro system. SMA sought planning approval for the CBD Metro from the NSW Department of Planning under the NSW Environmental Planning and Assessment Act 1979 (EP&A Act), and received it in January 2010. However, SMA withdrew its planning application for the proposed West Metro on announcement of the deferral.

As mentioned in Part 1, Section C, the Sydney Metro project was deferred in February 2010 by the then new NSW Premier, Kristina Keneally, coinciding with the release of the Metropolitan Transport Plan. Keneally said the Government had made the ‘tough’ decision to defer the Sydney Metro project, but also said a metro network remained a long-term public transport option and the Government would reserve the corridors for a metro in the future. This decision may have been influenced by the considerable controversy surrounding the project. The project received significant media coverage, such as from The Sydney Morning Herald, and backlash from community and industry groups. For example, the Save Rozelle's Heritage group campaigned against the project, concerned that the CBD Metro would affect heritage buildings in the suburb of Rozelle. Further, an Independent Public Inquiry was established with the support of The Sydney Morning Herald to create a Long-Term Public Transport Plan for Sydney. The Inquiry collated submissions from the public on Sydney’s transport. According to the Inquiry, many submissions saw the CBD Metro as diverting scarce resources away from improving public transport in areas of greater need. There was also a belief that the Sydney Metro project would compromise future rail corridors and infrastructure opportunities for the existing heavy rail network (the CityRail network) operated by the rail authority Railcorp. However, there was support for the Sydney Metro project from groups such as the Urban Taskforce and the Property Council, who claimed that the Sydney Metro project would be the ‘centrepiece’ in fixing Sydney's transport problems.

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174 Ibid 5.
175 West (2nd article), above n 169.
178 Independent Public Inquiry, ibid 60; West (2nd article) above n 169.
For example, by targeting the major corridors, such as Parramatta Road, Victoria Road and Anzac Parade, the Sydney Metro project looked set to relieve significant areas of growing transport congestion.\(^{180}\)

3 Organisational Structure and Procurement

Prior to the Sydney Metro project being deferred, the SMA had established many of its project delivery processes and systems. These processes and systems can be broadly separated into organisational structure, and procurement and delivery methods.

(a) Organisational Structure

The leadership-level structure of the SMA is outlined in Figure 3 below. At the top of the leadership-level of SMA sat the Sydney Metro Board. The Sydney Metro Board comprised a Chief Executive Officer (CEO), a member appointed by the Transport Minister on the nomination of the Treasurer and three other member appointed by the Minister.\(^{181}\) This Board had the function of determining the policies of the SMA.\(^ {182}\) As a NSW Government transport agency, the Transport Minister maintained some control over SMA including in giving written directions with respect to the exercise of SMA’s functions and in reviewing decisions.\(^ {183}\) There were then six tiers of SMA management including the senior leadership-level such as the general managers, the CEO and the Sydney Metro Board; and the Environmental Sustainability Manager, Communications Manager, Office Managers, Site Managers and Design Managers.\(^ {184}\) The organisational structure in terms of sustainability advisers is discussed in Part III Section B(9).

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\(^{181}\) Transport Administration Amendment (Metro Rail) Act 2008 (NSW) div 4, s 55F(2).

\(^{182}\) See Part III below on sustainability and environmental policies of the Sydney Metro Authority.

\(^{183}\) Transport Administration Amendment (Metro Rail) Act 2008 (NSW) div 4 s 55J(1),(3).

Early in the process, a Shadow Operator was procured to act like an internal client, and provide SMA operational capability to assist in the planning and procurement phases, and to maintain a central focus on delivering a safe, attractive and efficient metro railway network.186 The rest of the work was undertaken by project employees comprising 70 Government staff and expertise brought in from the private sector.187 These team members were from a number of different disciplines, including engineering, architectural, legal and probity, economic appraisal, planning and urban design. The project team was separated into different work streams under the various general managers. Of particular relevance is the Engineering and Architectural Advisor to SMA, known as PBACH, which undertook design processes and activities, and comprised the consultancies Parsons Brinkerhoff, Arup, The Cox Group and Hassell.

(b) Procurement and Delivery Methods

As discussed above, SMA was responsible for managing the delivery and commissioning of the Sydney Metro project. The delivery required the use of numerous delivery partners and subsequently a number of different contracts. The delivery method for the CBD Metro was separated into two main contract packages. The Permanent Route Infrastructure (PRI) contract was for developing the tunnels, and station excavation and passenger access.188 The

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185 Adapted from Sydney Metro Authority, above n 173, Section 4 – Program Management, 12.
186 Interviewee SE1; ibid.
188 Sydney Metro Authority, above n 173, 10.
Integrated Metro Operations (IMO) contract was for the rolling stock and rail systems, the trackwork and power supply, station fit-out, and long-term operations and maintenance. Both the PRI and IMO packages had gone out to tender, and were in the tender close stage when the Sydney Metro project was deferred. The CBD Metro section from Rozelle to Central was bid as a single design and construct contract package. Three consortia ended up being shortlisted out of a total of five who submitted detailed expressions of interest for the CBD Metro section. Two or three separate PRI contract packages based on geographical areas were to be used for the West Metro, depending on the final configuration. The IMO contract was bid as a single privately financed design, build, operate and maintain contract under a special purpose organisation termed the ‘IMO Project Company’. The IMO package was based on a single operator, rolling stock and core rail systems for the entire CBD Metro. Two consortia were shortlisted for the IMO contract, made up of national and international companies.

C Background – Olympic Delivery Authority (Transport Division)

1 Project Overview

This section provides details of the organisation of ODAT, as well as the project examples used to highlight the discussion of the ODAT case study in Part IV. It sets the scene, as well as the boundaries, for the ODAT case study. This section does not include any analysis regarding ODAT in the context of the research questions and objectives.

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189 Ibid 10.
190 Ibid 11.
191 Design and construct contract methods are defined in Part III, Section B(6).
194 Sydney Metro Authority, above n 173, 11.
On 6 July 2005 it was announced that London was successful in its bid to host the 2012 Summer Olympic and Paralympic Games, now known as the London 2012 Olympic Games (the Games). To facilitate the Games, an Olympic Park comprising numerous facilities and venues needed to be planned for delivery and operation. These facilities and venues include the Olympic Stadium, the Velodrome and the Olympic Village. The main body responsible for the delivery of the Games venues and infrastructure is the Olympic Delivery Authority (ODA). The London Organising Committee of the Olympic Games and Paralympic Games (LOCOG) is responsible for the staging, planning and hosting of the Games. For the purposes of this thesis, ODA and LOCOG together form the London 2012 Team.

Delivering new and upgrading existing transport infrastructure is an integral part of the program of works for the Games. The transport network in London requires additional capacity to facilitate the movement of people during the Games. Examples of projects in ODA’s transport program, which is primarily the responsibility of its transport division or ODAT, includes investment into trebling the capacity of Stratford Regional Station through activities such as widening station platforms and adding nine new lifts. Other urban rail projects in the transport program include the West Ham station upgrade and the Orient Way project. Walking and cycling routes are also being upgraded with improvements including wider paths, smoother surfaces and better entry and access points.

Orient Way, a new 12 road carriage berthing siding, was the first transport infrastructure project to be delivered by ODAT and was completed in March 2008. It was a critically important project because it needed to be delivered before parts of the Olympic Park could be built. More specifically, the Thornton’s Field Carriage Siding Depot (Thornton’s Depot) facility needed to be relocated because ODAT wished to utilise the land the Depot occupied. In order to facilitate the provision of alternative stabling arrangements, ODAT accepted responsibility for the project and made provision for this within the overall Games budget. The primary objectives of the project were to ensure that vacant possession of the existing Thornton’s Field sidings was made available by 30 June 2008; and to make available for

196 Ibid10.
Part II Section C

service new sidings with the equivalent functionality of the Thornton’s Depot. After considering two alternative sites for the replacement facility, the preferred location was the disused sidings at Orient Way, adjacent to the Eurostar maintenance depot at Temple Mills.

The scope of works for Orient Way included the demolition of the existing maintenance shed, oil re-fueling and storage equipment; removal of redundant track; preparation and re-profiling of the site as necessary to allow the installation of the new track layout; signalling; safe walking routes; driver access platforms; car parking; and a control room accommodation for up to ten people. Another critical component was the identification and management of interfaces with Network Rail infrastructure and on-network works that were being undertaken at the same time. Network Rail is the government body that owns and operates rail infrastructure in the United Kingdom (UK).

The West Ham Station upgrade (or West Ham project) comprises temporary capacity enhancements works. These enhancements are being made to cater for the higher number of spectators expected to use the station during the Games. A temporary walkway is being built to provide another entry and exit between the station and The Greenway, which spectators will walk along to reach the Olympic Park. There is also a new footbridge and a six metre wide staircase from the eastern end of the District Line Platform being constructed. Other works include widening of the existing Greenway ramp, the installation of a 16-person lift, and landscaping. Construction of the West Ham project is due to be complete toward the end of 2011.

The first and second research questions are responded to largely in the context of ODAT as an organisation to enable a comparison with SMA. However the third research question focuses in on the Orient Way and West Ham projects as specific examples through which to

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198 Olympic Delivery Authority, above n 197.
199 A map of the geographic location of the project can be found in Appendix II Figure 14.
200 Olympic Delivery Authority, above n 197.
examine ‘on the ground’ challenges facing ODAT’s approach to governing infrastructure sustainability, as well as how challenges were overcome. Focusing on project examples allows a better understanding of how ODAT’s approach to governing infrastructure sustainability is filtering down to project level activities. As discussed in Part I Section C, Orient Way is also an exemplar of infrastructure sustainability – evident in the attainment of an ‘excellent’ CEEQUAL, an assessment and awards scheme for improving sustainability in infrastructure projects, rating – making it a good project example for the ODAT case study. Also, at the time of conducting the interviews in London, the West Ham project was underway, and therefore some of the interviewees answered interview questions in the context of that project.

2 The Olympic Delivery Authority

ODA is a non-departmental public body accountable to the Secretary of State for Culture, Media and Sport, and is the statutory planning authority for the Olympic Park area, established under the London 2012 Olympic Games and Paralympic Games Act 2006 (the Olympics Act) on 30 March 2006. The Olympics Act was passed quickly after the announcement and gave ODA powers, particularly in planning, but also in other areas such as traffic regulation orders. ODA is its own planning authority, a role normally afforded only to democratically elected bodies.

ODA’s mission is to ‘deliver venues, facilities and infrastructure, and transport on time and in a way that maximises the delivery of a sustainable legacy within the available budget’. Legacy relates to on-going environmental, social and economic benefits after the completion of the Games, for example pertaining to transforming and revitalising areas of low socio-economic well-being in East London; and ensuring legacy use of all permanent venues and structures.

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204 Interviewee OL1.
205 Olympic Delivery Authority, above n 202, 5.
infrastructure.\textsuperscript{206} The importance of legacy as a driver for addressing infrastructure sustainability is discussed further in Part IV Section A.

ODA’s funding package is made up of grants from the National Lottery, the London Development Agency and the Department for Culture, Media and Sport. Additionally the ODA receives Council tax precepts from the Greater London Authority.\textsuperscript{207} Of the 9.345 billion pound total budget for the Games, 1.7 billion pounds has been allocated for infrastructure development and regeneration of the local area.\textsuperscript{208}

ODA itself is a relatively small organisation, commissioning work from various organisations to design and construct infrastructure. ODA’s main delivery partner is the consortium CLM, comprised of CH2M Hill, Laing O’Rourke and Mace. However, delivering new and upgrading existing transport infrastructure as part of the Games comes under the responsibility of ODAT, and the delivery of urban rail projects is undertaken primarily by the rail delivery arm of ODAT. ODAT is also responsible for Games time transport operations, namely moving people to, from and around the London 2012 sites.\textsuperscript{209} ODAT operates relatively autonomously from ODA\textsuperscript{210} However, ODAT is still answerable to the London 2012 Board and the CEO of ODA, and works with ODA on various issues. ODAT also works with delivery partners including Network Rail; Transport for London (TfL), the local government body responsible for most aspects of the transport system in Greater London; and the Highways Agency, an agency part of the Department for Transport in England.

\textsuperscript{210} Interviewee OS2.
3 Organisational Structure and Procurement

ODAT has well established project delivery processes and systems. These processes and systems can be broadly separated into organisational structure, and procurement and delivery methods.

(a) Organisational Structure

The leadership-level of ODAT, and its relationship to the rail delivery arm, is outlined in Figure 4 below. At the top of the leadership-level of ODAT is the Director of Transport. The next level down includes the Head of Transport Safety and Games Systems, the Stakeholder Relations Manager and the Head of Transport Planning. With respect to the rail delivery arm of ODAT, two key leadership-level positions exist – the Head of Capital Rail Projects and the Rail Projects Director (Figure 4). However, as will become apparent in Part IV Section B, the Head of Transport Safety and Games Systems and his team also have a role in ensuring ODAT’s infrastructure sustainability governance approach is being implemented on ODAT’s urban rail projects. These upper leadership-level positions are responsible for numerous ODAT employees, representing various work streams including health and safety, geographic information systems, planning, design, project management and procurement. Under the Rail Projects Director are approximately 34 employees comprising the rail delivery arm.\textsuperscript{211}

\textbf{FIGURE 4} – Leadership-level structure of ODAT\textsuperscript{212}

At the top of the leadership-level of ODA is the ODA Board and the ODA Planning Committee. The CEO then has responsibility for eight directors under four key areas of

\textsuperscript{211} Internal ODAT document (ODAT internal organisation diagram) emailed to author 12 May 2011.
\textsuperscript{212} Ibid.
venues and infrastructure, transport, administration, and planning decisions. Directors under venues and infrastructure include the Director of Construction Delivery whose team interfaces with ODA’s key delivery partner CLM. The Director of Transport is the only director under transport. ODA is ultimately accountable to the Department for Culture, Media and Sport and through it, other ODA funders and stakeholders including the National Lottery, the Greater London Authority and the London Development Agency.213

(a) Procurement and Delivery Methods

ODAT was still in its early stages of development when the need for the new sidings project became apparent. At these early stages, ODAT planned to be a small organisation that worked with the various transport agencies to deliver the required transport projects. However it was soon apparent that ODAT would have to establish the mechanisms itself to deliver various projects, including Orient Way.214 For example, it was intended that Network Rail would deliver the new sidings for ODAT, but this would have been unfeasible given the tight timeframe.215 ODAT therefore brought the project ‘in-house’, developing the rail delivery team as part of ODAT. Once this team was mobilised, various negotiations between the different stakeholders took place and a development agreement provided ODA with a right to undertake the construction of Orient Way. There were six parties to the agreement including the Secretary of State for Transport as the freeholder of the site, the Union Railways (North) Limited, Eurostar Limited, the Department for Transport as the tenant, the London Development Agency and ODA as the licensee.216

The reference design for Orient Way was procured through ARUP, and the detailed design process commenced after being procured from Atkins consultants through a design consultancy contract.217 A design and build (or construct) contract was awarded to Balfour Beatty Rail Projects Limited (Balfour Beatty) during the early part of the detailed design process in September 2007. Balfour Beatty was the principal contractor, and Atkins the sub-

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214 Interviewee OL1.
215 Interviewees OL1 and OL3.
216 Olympic Delivery Authority, above n 197.
217 Ibid.
contract designer. The company Fitzpatrick held the sub-contract for civil works. Similarly for West Ham, a reference design was procured by ODAT. The detailed design was then procured from Atkins under a detailed design consultancy contract.

D Conclusion

This part has provided detail on the methodology used to address the research objectives. The primary research method comprised of qualitative, case study research. Two case studies of SMA and ODAT were selected. Data collection included through semi-structured interviews and of project-related documentation. Data analysis adopted an inductive approach of constructing theories grounded in the data. The methodology also comprises a comparative study through which theory is validated and checked. Sections B and C of this part have provided background to the two case studies including information on the organisations and their respective projects. The SMA case study is presented in the next part.
III CASE STUDY – SYDNEY METRO AUTHORITY

A Infrastructure Sustainability Drivers

1 Overview

This section addresses the first research question pertaining to the key external and internal drivers for addressing and governing infrastructure sustainability in the context of the Sydney Metro Authority (SMA) case study. This research question is important for understanding the reasons why SMA was compelled to address infrastructure sustainability, providing essential background for the proceeding sections. The information has been compiled based on project-related documents and the interview process, supported where appropriate with existing literature. External drivers for SMA to address infrastructure sustainability are separated into legislative and policy, particularly in relation to the New South Wales (NSW) Government, and community and other external stakeholders. Internal drivers include maximising the inherent sustainability of a metro network, and leadership-level and project employee appetite for sustainability outcomes.

2 Legislative and Policy

Section 6(2) of the Protection of the Environment Administrations Act 1991 (Cth) includes five principles of sustainable development: i) the precautionary principle; ii) inter-generational equity, iii) conservation of biological diversity and ecological integrity, and iv) improved valuation, pricing and incentive mechanisms. These principles appear in a number of statutes relating to infrastructure delivery in NSW and hence the Sydney Metro project, including the Waste Avoidance and Resource Recovery Act 2001 (NSW) and the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act). Usually, these principles appear in the preamble and objects of acts providing that consideration should be

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220 See above Part II, Section A(4).
221 The most common definition of the precautionary principle is found in Principle 15 of the Rio Declaration: ‘Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.’
given to sustainable development by administrative decision-makers. The objects of an act indicate to the reader or user the intention, purpose or legislative goals of the act. As a result, sustainable development is not mandated as an outcome in the EP&A Act or other acts.

Despite the fact that sustainable development is not mandated as an outcome, there have been many cases in the NSW Land and Environment Court where these principles have been discussed and debated. Cases of relevance include Drake-Brockman v Minister for Planning & Anor, Gray v the Minister for Planning and Ors, and Telstra Corporation v Hornsby Shire Council. In these cases, the Minister of Planning or other administrative decision-makers’ decision to approve the project in question was challenged based in part on one or some of the principles of sustainable development. Even though there is arguably limited scope for these principles per se to prevent a project from being approved, it is prudent for proponents to address sustainability to avoid costly and generally unfavourable legal proceedings where sustainable development principles are used to challenge planning decisions. Infrastructure project proponents are generally aware of the potential costs, delays and reputational issues associated with being taken to court. This was highlighted by sustainability discipline interviewee SS1 who discussed such drivers for the Sydney Metro project:

Of interest is a successful green barrister that I know who has stopped coal mines in the past because they haven’t addressed climate change as part of the Minister’s approval. The reason I

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226 [2006] NSWLEC 133.
228 Walker, above n 223.
229 Here the interviewee is referring to the Anvil Hill mining case. In this 2006 case in the NSW Land and Environment Court, Justice Nicola Pain found that under Part 3A of the EP&A Act, an environmental assessment prepared on behalf of proponents for the Anvil Hill coal mine located in Hunter Valley was inadequate as it failed to contain a detailed analysis of ‘scope 3 emissions’ – greenhouse emissions generated from the burning of coal by third parties outside the control of the proponent. Although this has been heralded as a ‘landmark’ judgement, it has not been followed through in subsequent cases by subsequent judges. Nonetheless, it demonstrates the real potential for major infrastructure project proponents to be taken to court on
mention him is because those types of people have tremendous power to stop a project ... it’s a very real [incentive to address sustainability] because if you get held up in court for six months while a barrister takes you on in the [NSW] Land and Environment court, it could kill the project.

There are also several policy drivers for NSW Government infrastructure project proponents to consider sustainability. The NSW Government Sustainability Policy establishes a requirement for NSW Government agencies to address sustainability.230 Further, in its NSW Whole-of-Government Sustainability Principles, the NSW Government defines sustainability for the public sector as ‘addressing the needs of current and future generations through the integration of social justice, economic prosperity and environmental protection in ways that are transparent, accountable and fiscally responsible’.231 The NSW Whole-of-Government Sustainability Principles aim to set out a common understanding and framework of what sustainability means for the government sector. As a NSW Government agency, these principles were applicable to SMA and were considered by SMA in the development of its approach to governing infrastructure sustainability,232 discussed further in Section B below.

There is also government policy pertaining to individual categories of infrastructure sustainability such as water, waste, energy, and social-well being including employment.233 For example the NSW Government’s Waste Reduction and Purchasing Policy requires all State Government agencies to develop and implement a Waste Reduction and Purchasing Policy Plan to reduce waste and increase the purchase of recycled content materials in four areas including landscaping materials, and construction and demolition materials. Apparently, SMA would have implemented such a Plan should the project have gone ahead.234 Also of relevance is the NSW Government’s Aboriginal Participation in Construction Guidelines from 2001 which requires active and on-going engagement of Indigenous employees on government construction projects. Although such policies are required of government

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233 See Part I Section A(2) on infrastructure sustainability definition.
234 Interviewee SS1 and SL2.
agencies in NSW, there is limited information on how diligent these agencies are being in implementing these policies.

3 Community and Stakeholders

As outlined in Part I Section A, by being active in infrastructure sustainability and communicating this to community groups and other stakeholders, there is a potential to increase public acceptability for a project. Such a driver appears to have motivated SMA’s activity on infrastructure sustainability, as discussed by interviewee SS1:

Community expectation is a driver, particularly where we are [dealing] with is a pretty educated, vocal part of the community in Rozelle, so if we didn’t have a sustainability person and a sustainability component to the project, the media, driven by the community response, would be outraged. We’ve had quite a lot of submissions [on the CBD Metro] and the feedback from the website was “well, what are you doing about sustainability?”

An interviewee from the leadership-level of the SMA, SL2, had similar sentiments, stating that ‘you’d certainly be needing to justify ... the project in sustainability terms because of the sheer public awareness that is currently out there ... and community expectations on issues such as energy usage’. Another sustainability discipline interviewee, SS3 observed that ‘increasingly as the community places a bit more emphasis on [sustainability] we need to please communities, and to please communities we need to come up with a design that responds to this issue of sustainability’.

In a worst case scenario, being taken to the NSW Land and Environment Court would damage reputation because it is a public demonstration of a lack of due diligence on social or environmental issues. In NSW, not-for-profit legal environmental groups like the NSW Environmental Defenders Office continue to represent community groups in cases relating to infrastructure projects. Therefore when communities are dissatisfied with a project, they have avenues through which to voice their concern and this can lead to a number of barriers to project delivery, as discussed above. This is therefore a driver for proponents such as SMA to take action, and then communicate progress, on infrastructure sustainability and sustainability outcomes.
Stakeholders other than the community, for example project employees, may also drive consideration of infrastructure sustainability issues. Project employees may retain a sense of satisfaction and well-being when involved in infrastructure sustainability. The existence of employee pride in relation to infrastructure sustainability as outlined in Part I, Section B, was also raised by sustainability discipline interviewee SS2 who stated that ‘it is about pride for you as a person involved in project delivery ... pride in the product’.

4 Maximising Inherent Sustainability

Another driver for infrastructure sustainability on the Sydney Metro project was the notion of maximising the inherent sustainability of a metro network. This driver was discussed by a number of interviewees.

Urban rail infrastructure facilities in general are often viewed as sustainable because of the role in facilitating modal shift from private vehicles to public transport. Such a shift is associated with increased energy efficiencies and reduced greenhouse gas (GHG) emissions per passenger kilometre travelled. Hence, there is an inherent sustainability value to urban rail infrastructure facilities including metro railways, and they may be considered ‘sustainable infrastructure’. This was highlighted by interviewee SL2 who stated that ‘I think inherently [the Sydney Metro project is] sustainable because it [will provide] a public transport system. By definition you’re doing a lot of good things from that point of view’.

In addition to the Sydney Metro project’s inherent sustainability as a public transport option, there was discussion by some interviewees of further inherent value as a metro railway. For example, interviewee SL2 added that:

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235 See Part I Section A.
237 Smith compares the energy efficiency of various forms of transport in above n 237, 246-7.
238 See Part I Section A(1).
I did see the Metro as being a transformational product in terms of what it was doing for Sydney ... Metros, because of their inherent nature, will transform how you use this city ... there’s an option of actually guiding urban development or metropolitan planning ... so you’re providing a new system in a new city environment which hasn’t happened before.

This perceived importance of the Sydney Metro project in a broad city-planning sense, as well as its role in providing a public transport facility, was highlighted as a key objective of the CBD Metro, which was to contribute to the environmental and social sustainability and strong economic global position of the city. However, as the project delivery phase presents numerous negative impacts to be minimised and opportunities that can be maximised, there is the potential to maximise this inherent sustainability through infrastructure sustainability. Interviewee SL2 confirmed that infrastructure sustainability was important to SMA:

On Sydney Metro, we branded it as green right from the beginning, so in terms of what we were trying to achieve ... we wanted to make sure that we were able to demonstrate very very clearly that when the project was built, that we actually thought about a whole lot of issues to do with the project from a sustainability point of view.

Interviewee SS1 believed that in general the leadership-level of SMA recognised the need to drive infrastructure sustainability in the various project delivery stages, suggesting that ‘the executive gets that this is an opportunity to increase the sustainability of the city. They generally do understand that one of the reasons you put in a Metro is for sustainability. They also recognise that that doesn’t happen unless you drive it [in project delivery]’.

5 Leadership-Level and Employee Appetite

The existence of leadership-level and broader project employee appetite for sustainability outcomes was an internal driver for addressing infrastructure sustainability on the Sydney Metro project. As interviewee SL2 asserted, ‘it is the leadership who will influence these things ... It is really critical that the message that goes down through the organisation is one

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240 See Part I Section A.
of support for these sorts of approaches, that they are worthwhile’. Interviewee SD2 concurred, stating that:

There was high-level support within the organisation and at the end of the day, that is what it comes down to. You’ve got to have the support higher up within management because otherwise you end up just hitting your head against a glass ceiling and you just cannot break through.

Interviewee SS1 discussed in particular the importance of having the Chief Executive Officer (CEO) committed:

If the CEO wasn’t into [sustainability], I would have had a hard time. He doesn’t go home and read nature magazines. But he gets why you need sustainability, he gets the value. You still have to use the process of a business case and evidence based decision-making but if the CEO isn’t in favour, [you] wouldn’t be able to push the sustainability agenda.

It is the leadership-level of a proponent organisation that generally makes the key decisions pertaining to a project. This is because it is the proponent organisation that has key decision-making responsibility in determining whether to address infrastructure sustainability on a particular project. As Klotz and Hormann remark, project ‘owners typically make the final decision on whether or not to build sustainably’.241

That other project employees demonstrate an appetite for sustainability outcomes is also critical. However, as discussed in Section B(8) below, not all SMA project employees comprising the project team were enthusiastic about sustainability outcomes. Interestingly, such enthusiasm is not only a driver of infrastructure sustainability, it can also be an outcome, specifically when there have been capacity building and knowledge sharing activities.242

Within SMA, there were project employees interested in infrastructure sustainability, and this was attributed in part to the fact that many individuals came from European countries, such as the UK and Germany, where many sustainability initiatives including regenerative braking243

241 Klotz and Hormann, above n 71, 602.
242 See Section B(12) below.
243 Regenerative braking is a system that allows some of the kinetic energy generated during train braking to be captured and returned to the traction power supply and used elsewhere within the system. Where regenerative braking is used, the available energy can be utilised immediately by other accelerating trains on the network or it may be sent to receptive substations that feed the electricity back into the grid. Sydney Metro Authority, ‘Sydney Metro Network Stage 2 (Central – Westmead) Draft Environmental Assessment Report’ (Report, Transport NSW, 2010) <www.transport.nsw.gov.au/sites/default/file/metrodocs/> at 3 November 2010, 20-45.
are commonplace.\textsuperscript{244} SMA project employee appetite for sustainability outcomes was also connected to the perceived inherent sustainability value of the Sydney Metro project. According to SL1:

One of the things we had with Metro was that people genuinely felt that it was a sustainable project. Not only because of what we were doing with respect to design, but the long-term gain of getting people out of cars, onto public transport. That drove a very good atmosphere in here. There was a bit of high moral ground. We were doing the right thing ... we would rather build rail than road.

\section*{B Approach to Governing Infrastructure Sustainability}

\subsection*{1 Overview}

This Section responds to the second and third research questions relating to SMA’s approach to governing infrastructure sustainability, and the key challenges relating to the approach, and how these challenges were overcome. The overall structure of the approach, embedded in an Sustainability Management Framework, is discussed, followed by the process for setting infrastructure sustainability targets, objectives and initiatives. The interfaces between the approach and design, planning approvals and procurement processes is described in detail because of the significance of these interfaces. Various challenges are then presented, including how these were overcome, in particular in the context of planning approvals and procurement. A discussion of the roles and responsibilities of sustainability advisers is a feature of this Section. The approaches to knowledge sharing and capacity building; and measuring, monitoring and reporting, are also discussed.

\subsection*{2 Overall Structure}

The overall approach to governing infrastructure sustainability was set out within a Sustainability Management Framework summarised in Figure 5 below. This Framework brought together all of the key components including the Sustainability Policy, the

\textsuperscript{244} Interviewee SE1.
Sustainability Position Paper, Sustainability Plans, the draft Sustainability Report, and the Sustainability Initiatives Register (SIR) (discussed in Sections 3 and 4 below).

The Sustainability Policy was the SMA’s central sustainability governance document for the organisation and for all of its projects. The Sustainability Policy was prepared in consultation with internal and external stakeholders. It contained 10 sustainability themes of governance; energy; GHG emissions; climate change adaptation; resource efficiency; water; biodiversity; community and stakeholder involvement; community benefit; and economic vitality and viability. The theme of ‘governance’ is clearly of particular importance and the processes and initiatives associated with this theme are discussed throughout this Part. The use of ‘themes’ is an approach similar to the impact and opportunity area categories adopted by many sustainability performance rating and assessment tools, as discussed in Part 1 Section A(2). Themes are also used to define infrastructure sustainability in Part I Section A(2). SMA’s themes were initially developed by the Engineering and Architectural Advisor to SMA (PBACH) sustainability advisers for the CBD Metro and were the core contents of the draft Sustainability Report. These themes were then applied to all facets of the approach to governing infrastructure sustainability in recognition of the philosophy that ‘there are only so many ways you can cut sustainability’.

The Sustainability Position Paper developed policy positions on the different sustainability themes. There was a scale of three possible policy positions – leadership, beyond compliance or compliance-based. For a particular theme, a leadership position would seek to achieve world best practice; beyond compliance would involve utilising technologies and processes that have been proven to be functional and viable elsewhere; and compliance-based would involve meeting legal and policy requirements but going no further. Within the Sustainability Position Paper, a policy position on each of the ten themes was recommended based on an analysis of applicable government policies and legislation, and impacts and

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245 Ibid 8-5; Sydney Metro Authority, above n 239, 209 and 211.
246 Interviewee SS1.
247 See Section 9 below.
248 Interviewee SS1.
249 Ibid.
250 Sydney Metro Authority, above n 243, 8-5.
251 Interviewee SL2 and SS1.
252 Interviewee SS1.
opportunities across environmental, social and economic dimensions.\textsuperscript{253} This helped to inform which themes, and initiatives, would be the focus of resources and efforts.\textsuperscript{254} Sustainability Plans were to be developed for the CBD Metro and the West Metro by the successful Integrated Metro Operations (IMO) consortium, and are discussed further in Section 6 below.

\textbf{FIGURE 5 – Sustainability Management Framework for SMA}\textsuperscript{255}

\begin{itemize}
  \item Continuous improvement
  \item Targets Vs Actual
\end{itemize}

\begin{itemize}
  \item Energy
  \item Greenhouse gas emissions
  \item Climate change adaptation
  \item Resource efficiency
  \item Water
  \item Biodiversity
\end{itemize}

\begin{itemize}
  \item Community & stakeholder involvement
  \item Community benefit
  \item Economic vitality & viability
\end{itemize}

\textbf{ACTIVITIES - Integrate sustainability into all activities}

\begin{itemize}
  \item Metro network delivery & service (PRI & IMO)
  \item Sydney metro corporate activities
\end{itemize}

\textbf{MONITORING & REPORTING}

\textsuperscript{253} Ibid.
\textsuperscript{254} Interviewee SL2.
\textsuperscript{255} Sydney Metro Authority, above n 243, 8-4.
3 Sustainability Targets, Objectives and Initiatives

(a) Background

Setting objectives and targets for achieving sustainability outcomes in project delivery (sustainability objectives and targets) is important. Both sustainability objectives and targets relate to achieving a certain outcome, and will typically exceed compliance requirements. For the purposes of this thesis, sustainability targets are more quantitative, for example a target of ten Indigenous employees or 80 per cent recycled content in key construction materials. Sustainability objectives are more qualitative, for example increasing employment opportunities for disadvantaged groups, or reduction in the use of virgin materials during construction. Sustainability objectives would usually require actual targets to make the desired outcomes tangible. George states that ‘definitions of objectives [and] targets for meeting them ... is an important part of applying sustainable development principles in practice’. The process of setting sustainability objectives and targets will vary from project to project but key features include negotiation between project employees and external stakeholders, and consideration of existing corporate sustainability objectives and targets relating to the proponent or delivery partners.

(b) Sydney Metro Authority Approach

On the Sydney Metro project, sitting above specific infrastructure sustainability initiatives (sustainability initiatives) for the different themes were numerous sustainability objectives. These sustainability objectives were tabulated in the CBD Metro and the West Metro environmental assessment reports (Table 2). The environmental assessment reports did not specify actual sustainability targets except in a few instances, namely in relation to energy use and GHG emissions as outlined above. The lack of actual sustainability targets was due to

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258 van Bueren and De Jong, above n 126, 553.
the fact that specifics of the project had not been established at the early project delivery stages of design and planning approvals. Also, actual sustainability targets were to be negotiated between SMA and the successful bidding contractors. This is discussed further in Section 6 on procurement processes below.

**Table 2 – SMA’s sustainability objectives**

<table>
<thead>
<tr>
<th>THEME</th>
<th>OBJECTIVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Governance</td>
<td>Maximise sustainable outcomes through integration of sustainability into project delivery, including design processes; and adhere to a system of sustainability governance through the Sustainability Policy and Sustainability Management Framework.</td>
</tr>
<tr>
<td>Energy</td>
<td>Minimise energy demand; increase efficiency; and use renewable energy.</td>
</tr>
<tr>
<td>Greenhouse gas emissions</td>
<td>Minimise contributions to climate change through low emissions during construction; and high patronage and low emissions during operations.</td>
</tr>
<tr>
<td>Climate change adaptation</td>
<td>Design to withstand the effects of climate change and maximise environmental comfort for passengers and workers.</td>
</tr>
<tr>
<td>Resource efficiency</td>
<td>Maximise resource efficiency over the project lifecycle; reduce waste generation; recycle to recover resources; design for end of life; avoid production of hazardous waste; and minimise land take.</td>
</tr>
<tr>
<td>Water</td>
<td>Minimise use of potable water; maximise efficiency in water use; reclaim and reuse stormwater and wastewater; and manage aquifer and surface water interference to protect ecosystems.</td>
</tr>
<tr>
<td>Biodiversity</td>
<td>Achieve a net increase in biodiversity by minimising the impact on and enhancing existing biodiversity including through the delivery of new habitat.</td>
</tr>
<tr>
<td>Community and Stakeholder Involvement</td>
<td>Actively engage the local community in the development and implementation of the project including to maximise patronage.</td>
</tr>
<tr>
<td>Community Benefit</td>
<td>Facilitate healthy living in sustainable and liveable communities, maximise access and connectivity; promote and enhance culture, diversity and heritage; and maximise safety, employment and opportunity.</td>
</tr>
<tr>
<td>Economic vitality and viability</td>
<td>Maximise community benefit in return for investment; and create enhanced land values and development opportunities around the metro corridor through well integrated master planning of station precincts.</td>
</tr>
</tbody>
</table>

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259 See Section 6.
260 Adapted from Sydney Metro Authority, above n 239, 213-218 and Sydney Metro Authority, above n 243, 8-8-14.
Examples of the types of initiatives under each theme and objective are now outlined to provide a holistic picture of proposed infrastructure sustainability activities for the Sydney Metro project:

(i) Energy and Greenhouse Gas Emissions

During the construction phase of the West Metro, initiatives for addressing energy consumption were to include sourcing 20 per cent of electrical energy from renewable sources, the use of energy-efficient site lighting, and the consideration of the embodied energy of materials such as cement and steel.\(^{261}\) For the CBD Metro, initiatives included that operational emissions would be partially offset by purchasing a component of renewable energy,\(^{262}\) although according to the majority of interviewees, a target to offset 100 per cent of operational emissions for the CBD Metro (namely through the use of 100 per cent renewable energy) was developed and signed off at the leadership-level.\(^{263}\) Energy efficiency in operation was also to be enhanced through the use of regenerative braking to reduce traction energy demand. In terms of station design, SMA was proposing to utilise a bespoke rating tool for stations, potentially in consultation with the Green Building Council of Australia, to assist with ensuring that stations would be designed to be energy efficient.\(^{264}\) Specific initiatives to be built into the design of the stations included the development of natural lighting strategies and the inclusion of photovoltaic cells to generate renewable power.\(^{265}\)

(ii) Resource Efficiency

Resource efficiency initiatives for the CBD Metro were to include sourcing fill material for the Rozelle stabling and maintenance depot site from spoil arising from the project, and having on-site waste separation facilities for all stations.\(^{266}\) For the West Metro, initiatives included assessing the life cycle of materials and favouring materials with lower embodied

\(^{261}\) Sydney Metro Authority, above n 243, 20-43.
\(^{262}\) Sydney Metro Authority, above n 239, 209 and 480.
\(^{263}\) Interviewees SS1, SS2, SS3, SL1 and SL2.
\(^{264}\) Sydney Metro Authority, above n 243, 20-44. See Section 10 below.
\(^{265}\) Ibid.
\(^{266}\) Sydney Metro Authority, above n 239, 480.
environmental impacts during design stages. During the construction stage of the West Metro, initiatives included the reuse of concrete, bricks and other structural materials from the site where appropriate. Initiatives relevant to operations included providing recycling bins at stations.

(iii) Climate Change Adaptation

Initiatives relating to climate change adaptation for the CBD Metro were to include, during design stages, utilising materials and finishes capable of withstanding likely increases in future solar radiation as a result of climate change. In relation to the Rozelle stabling and maintenance depot, hydrology and drainage design was to address current predictions relating to future sea level rise, increased rainfall intensity and storm surges associated with climate change. For the West Metro, initiatives again related to the selection of materials to withstand future solar radiation and heat waves during design, and providing maintenance regimes to accommodate the potential for acceleration in the degradation of materials and structures, during operation.

(iv) Biodiversity

Biodiversity initiatives for the CBD Metro were to include the use of native species in preference to introduced species for landscaping, and the creation of green space and green corridors during design stages. The use of native species for landscaping was also an initiative for the West Metro, as well as the avoidance of environmentally sensitive areas and the off-setting of any loss of vegetation by planting elsewhere. This second initiative was not relevant to the CBD Metro because it was to be developed on predominantly brownfield, or pre-developed sites, where few ecologically sensitive areas exist.

\[\text{References}\]

267 Sydney Metro Authority, above n 243, 8-8-11.
268 Ibid.
269 Ibid.
270 Sydney Metro Authority, above n 239, 479.
271 Ibid.
272 Sydney Metro Authority, above n 243, 8-8-10.
273 Ibid.
274 Sydney Metro Authority, above n 239, 480.
275 Ibid.
276 Ibid.
277 Ibid.
278 Ibid.
279 Ibid.
280 Ibid.
281 Ibid.
282 Ibid.
283 Ibid.
284 A green corridor is an area of habitat connecting flora and fauna populations separated by human activities including as a result of infrastructure development.
285 Sydney Metro Authority, above n 239, 217.
286 Sydney Metro Authority, above n 243, 8-8-12.
(v) Water

Water initiatives for the CBD Metro were to include the capture of rainwater to supply the Rozelle stabling and maintenance depot’s non-potable requirements, and having water sensitive urban design features.277 Other initiatives included seeking partnerships for the re-use of water during construction.278 For the West Metro, initiatives included incorporating water efficient fixtures and water recycling features into design, the reuse and recycling of water during construction where practicable, and the use of recycled and harvested rainwater for landscape irrigation where feasible.279

(vi) Community and Stakeholder Involvement and Community Benefit

In relation to community and stakeholder involvement, initiatives for the CBD Metro and the West Metro were to include undertaking ongoing survey of community members on what would encourage them to use the station, and to walk, cycle or catch public transport to the station to inform design stages.280 Other initiatives included preparing and implementing comprehensive Stakeholder and Community Involvement Plans to keep stakeholders and the community well informed about the projects during construction.281 Initiatives for community benefit for both the CBD Metro and the West Metro included applying design principles to create safe, legible and attractive stations, and ensuring accessibility of stations and rolling stock for people with disabilities.282

(vii) Economic Viability

For both the CBD Metro and the West Metro, design stage initiatives relating to economic viability were to include improving interchange with different modes of transport, including light rail and buses, to increase patronage.283 Another initiative for the CBD Metro was to provide a ‘hub’ of a wider network that would allow future extensions to the west and north-

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277 Sydney Metro Authority, above n 239, 480.
278 Ibid 217.
279 Sydney Metro Authority, above n 243, 8-8-12.
280 Sydney Metro Authority, above n 239, 213.
281 Ibid 21 and 33.
282 Ibid 214; Sydney Metro Authority above n 244, 8-8-13.
283 Ibid 218; Ibid 8-8-14.
The latter initiative is arguably implicit to the nature of the Sydney Metro project itself, rather than a result of any specific undertakings. Another initiative for both the CBD Metro and the West Metro related to the application of station design principles that promoted transit-oriented development around station sites. Such initiatives are clearly linked to the principle of whole-of-life thinking, especially in relation to providing a platform for future development of the metro network, thereby providing additional mass transit capacity.

4 Design Processes and Infrastructure Sustainability

(a) Background

The design stages of a project are widely considered to be crucial in achieving sustainability targets, objectives and initiatives. Design activities take place as early as planning and feasibility, right through to detailed design (Figure 1). Planning and feasibility, is where possible design solutions are generated and evaluated in the form of conceptual designs and feasibility studies. The outcome of this stage is a preferred design option to implement, and a reference design or similar is typically a key output. Detailed design is where the technical design and implementation plan are finalised. Early delivery stages have the ‘greatest potential to influence overall project sustainability at the lowest cost’ because it is where the shape and form of the project is still being determined. Where sustainability is integrated as part of all design stages, there is a good chance that sustainability outcomes will materialise because initiatives will effectively be ‘locked in’ as part of the project, and will be

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284 Ibid 218.
285 Transit-oriented development involves the creation of compact, walkable communities centred around high quality rail systems. Transit-oriented development is designed to encourage public transport, linking various transit options, and incorporates mixed-use residential and commercial development. Scanlon, above n 35.
286 Sydney Metro Authority, above n 239, 218.
287 Shen et al, above n 11, 66; Dewberry and Monteiro de Barros, above n 51, 30; Ugwu et al, above n 79, 235; Vanegas, above n 15, 5368.
288 McConville and Mihelcic, above n 93, 939.
289 A reference design is the technical ‘blueprint’ of a system, containing the essential elements that can be adapted and changed in later design stages. It is not contractual, but is an information document usually given to the bidding contractors at the procurement stage.
290 Ibid.
291 Vanegas, above n 15, 5368.
embedded in the fees associated with its construction.\textsuperscript{292} ‘Locking in’ does not necessarily refer to locking in a particular technology. On the contrary, building flexibility into design will be critical so that new technologies can be adopted in future where needed.\textsuperscript{293}

Sustainable design principles include innovation, life cycle costing, energy efficiency, flexibility and material recyclability.\textsuperscript{294} Innovative design initiatives and concepts that contribute to reducing costs and improving other aspects of project performance are particularly highly valued.\textsuperscript{295} These sustainable design principles link in with the infrastructure sustainability principles described in Part I Section A including whole-of-life thinking and innovation. There is a possibility that infrastructure design professionals will become increasingly adept at applying sustainable design principles. This is because there appears to be a push within the design, including engineering, education fraternity to include mandatory sustainability topics in tertiary education.\textsuperscript{296}

As indicated in Part I Section A, many of these sustainable design principles are addressed in typical design-related activities such in value management exercises. Value management or value engineering is a technique aimed at improving project value, or more specifically:

A proactive, problem-solving or seeking service, which maximises the functional value of a project by managing its development from concept to use through structured, team-oriented exercises, which make explicit, and appraise subsequent decisions, by reference to the value requirements of the clients.\textsuperscript{297}

\textsuperscript{292} However, exercises such as constructability reviews and value management have been associated with the culling of certain sustainability initiatives in the name of cost reductions. This is discussed further below.

\textsuperscript{293} See Part I Section A(2).

\textsuperscript{294} Shen et al, above n 11, 66.


\textsuperscript{297} Zainul Abidin and Pasquire, above n 5, 276.
Similarly, the NSW Treasury’s 2004 Value Management Guideline describes value management as ‘a structured, analytical process for developing innovative, holistic solutions to complex problems’. 298 Other definitions of value management or value engineering include a ‘rigorous and systematic effort to improve the value and optimise the life cycle cost of a facility’. 299 Value management exercises can therefore facilitate adoption of the whole-of-life thinking principle in the design stages of an infrastructure project.

Zainul Abidin and Pasquire believe that value management has intrinsic capability to achieve sustainability outcomes. 300 They observe that although the term sustainability may not be used frequently in value management, sustainability objectives and principles such as energy efficiency and minimising waste are commonly addressed in value management exercises as standard practice. 301 This is advantageous for those seeking to promote the adoption of infrastructure sustainability within a project team. If project team members realise that they are already doing things that are considered to be ‘infrastructure sustainability’, it might enhance the palatability of adopting an infrastructure sustainability agenda. This is supported by a study that revealed that some construction companies are linking the concept of infrastructure sustainability with value management. 302

At the same time, however, some sustainability initiatives may be removed during value management exercises in an attempt to reduce costs. 303 This is particularly true for those initiatives that do come at a cost premium, and their contribution to reductions in capital and/or whole-of-life costs is difficult to ascertain. It is therefore imperative that ‘value’ is defined in such exercises to encompass enhancing environmental and social performance, not just economic performance. To achieve this, sustainability has to be clearly identified as a project value and commitment in key governance documents. Sustainability advisors can then point to those documents and how ‘value’ is defined to both motivate workshop participants during value management exercises and hold them accountable.

300 Zainul Abidin and Pasquire, above n 29, 169.
301 Zainul Abidin and Pasquire, above n 5, 276.
303 Pulaski et al, above n 71, 89; Pulaski and Horman, above n 299, 1275.
(b) Interface with Sustainability Targets, Objectives and Initiatives

Various interviewee responses support the literature in terms of the importance of integrating infrastructure sustainability with design processes, and more specifically, doing so right from the start. For example interviewee SL1 stated that ‘you have to get [sustainability] in design right from the start. You have got to capture it upfront’. This is because if sustainability initiatives are locked into design, and hence into contractual arrangements, the constructing contractors will have to deliver on them. It also means that, as discussed above, tendering contractors can build initiatives in as part of their proposed fees. As interviewee SL1 articulated, SMA’s ‘proposition was always, we should build it in as a core part of the project, and build it into the price’. The interface between procurement processes and sustainability objectives, targets and initiatives is discussed further in Section 6 below.

It is crucial that the designers have a good understanding of what initiatives are both feasible and will deliver sustainability outcomes. As interviewee SE2 further explained:

> Being an experienced design team is the most important thing. Because if you’re not experienced, you don’t really know what is out there and sometimes there is a risk that you’re not going to get the best product.

SMA and the PBACH advisers were involved in early, conceptual stages of design up to developing the reference design that was provided to the consortia bidding for both the Permanent Route Infrastructure (PRI) and IMO contracts. The design team comprised a host of design specialisations including architectural and engineering designers. It included designers from the PBACH team and SMA. The PBACH sustainability advisers worked with this design team from the very early stages. Further discussion of their role and responsibilities in this context is provided in Section 9 below.

From the very early design stages, the design team was required to consider infrastructure sustainability initiatives and opportunities. According to interviewee SD2, the drive for this came from the leadership team, as outlined in Section A(5) above. In terms of design, infrastructure sustainability was championed by the SMA Design Manager, the Environmental Sustainability Manager and PBACH sustainability advisers. Weekly
Part III Section B

Sustainability meetings or workshops were held between the design team including the Design Manager, the Environmental Sustainability Manager and PBACH sustainability advisers. In these meetings, opportunities for infrastructure sustainability were explored. Opportunities explored included in relation to material types and quantities, and where those materials were to be sourced. \(^{305}\) In addition, building flexibility into design was also addressed, and interviewee SL2 gave an example of air conditioning in stations. He stated that SMA and the successful IMO contractors may not have had to put in an air conditioning system straight away, but they would have needed to make space available within the design to facilitate it in future, to address increased severity and number of hot days. \(^{306}\)

The design team in collaboration with these other actors such as the Environmental Sustainability Manager investigated and developed targets and initiatives. These targets and initiatives were documented in a Sustainability Initiatives Register (SIR). The main purpose of the SIR was to track the identification, refinement and implementation of specific sustainability initiatives throughout all project delivery stages and operation. \(^{307}\) The SIR was linked to the draft Sustainability Report, which included research and technical studies on specific initiatives and initiative areas for the different themes. Both the SIR and the draft Sustainability Report informed the reference design for the CBD Metro. \(^{308}\) Some of the sustainability initiatives identified as part of the SIR were embedded into the reference design at the time the environmental assessment reports for CBD Metro and West Metro were submitted. \(^{309}\) Other initiatives would have been assessed and developed further during the detailed design stage \(^{310}\) (Figure 1) and through procurement processes. \(^{311}\)

The interface between the design processes and sustainability targets, objectives and initiatives was therefore encapsulated in the SIR. Specifically, it allowed the development and implementation of initiatives and targets to be tracked. It also informed subsequent delivery processes such as procurement. In this way, the SIR was a crucial component of the Sustainability Management Framework.

\(^{305}\) Interviewee SD2.

\(^{306}\) As predicted to result from climate change. See CSIRO, above n 45.

\(^{307}\) Sydney Metro Authority, above n 243, 8-6.

\(^{308}\) Interviewee SS2.

\(^{309}\) Sydney Metro Authority, above n 239, 212; Sydney Metro Authority, above n 243, 8-7; interviewee SS4.

\(^{310}\) Sydney Metro Authority, above n 239, 212.

\(^{311}\) See Section 6 below.
The process of developing and implementing sustainability initiatives in the early design stages, namely into the reference designs, was complemented by a Design Review Panel that comprised independent specialist expertise in various disciplines including sustainability. The Review Panel’s role was to ensure that SMA was maximising sustainability opportunities and minimising impacts across the various project components, namely station design and along the alignment. They also had a role peer reviewing the sustainability requirements that went into the procurement documentation. According to SD1, ‘[SMA] wanted a sustainability representative on the Design and Review Panel to have a look [at] the inherent parts of sustainability through design but also to work with [SMA] on their sustainability policy and framework for Sydney Metro’.

5 Planning Approval Processes and Infrastructure Sustainability

(a) Background

Planning approval under Part 3A of the EP&A Act was sought for both the CBD Metro and the West Metro. Part 3A provided the assessment and approvals process for major infrastructure projects in NSW from 2005 until early 2011 when it was repealed following the election of the NSW State Coalition Government in early 2011. Part 3A of the Act commenced on 1 August 2005, with the intention of streamlining the development application process for major projects. The Minister for Planning was the approval authority for all projects assessed under Part 3A.

To begin the process, the proponent lodged a project application with the Director-General of Planning. The Director-General of Planning had a great deal of discretion in deciding what form of environmental assessment would be required for a Part 3A project, and what issues
the assessment would cover. Once the proponent lodged a project application, the Director-General prepared the environmental assessment, or Director General’s, requirements (DGRs) for the individual project, which were then given to the proponent. The Director-General could require the proponent to include in an environmental assessment a Statement of Commitments (SoCs). SoCs were a list of measures that would be implemented to avoid, minimise, manage, mitigate, offset and/or monitor impacts identified in the impact assessment sections of an environmental assessment report. SoCs were significant in that they may have informed the conditions of approval.

The conditions of approval formed part of the NSW Planning Minister’s terms for approving the project, with which the proponent needed to comply. The NSW Department of Planning then monitored the implementation of the conditions of approval, which may have included preparation of monitoring and compliance reports, and undertaking independent environmental audits. The Department also conducted inspections and compliance audits for approved projects. The NSW Department of Planning states that ‘non-compliance with conditions of approval could attract enforcement actions, which range from serving notices requiring rectification work, imposing fines or bringing legal proceedings in the Land and Environment Court’. But because most projects that triggered the Part 3A process were in fact government owned, and hence the government was the proponent, there was a degree of self-regulation in addressing the conditions of approval. As interviewee SR1 explained:

In the situation where the proponent is the government it has a high level of responsibility and public accountability to be self regulating and checking that it is itself compliant with the conditions of approval.

318 Environmental Planning and Assessment Act 1979 (NSW) s 75F(2) and (3).
319 Ibid s 75F(6); Sydney Metro Authority, above n 239, 477.
320 Sydney Metro Authority, above n 239, 477.
322 Ibid. Enforcement powers for Part 3A conditions of approval were provided in Part 6 Division 2A of the Environmental Planning and Assessment Act 1979 (NSW).
323 Ibid.
However as Flyvbjerg states, ‘one should be sceptical of ... officials who promise to regulate themselves’. 324

Although an analysis of the merits of the Part 3A process is beyond the scope of this thesis, the process has been criticised over the years for compromising the NSW planning system. For example, there was concern that the Part 3A process gave too much decision-making power to the Minister, who may have vested political interest in seeing a project approved; and that the process reduced the capacity of affected communities to influence the final outcome. 325 Such analysis is redundant given that Part 3A was repealed.

(b) Interface with Sustainability Targets, Objectives and Initiatives

On the Sydney Metro project, the environmental assessment reports summarised the practical application of the SIR initiatives outlined above. Some of these initiatives became part of the draft SoCs for the CBD Metro, namely under design and construction stage commitments, 326 so that the SoCs basically ‘mapped what the designers were already doing’. 327 For the CBD Metro, the SoCs also had implications for procurement because it was intended that any contractor selected to undertake planning, design, construction or operation of the CBD Metro would be required to undertake all works in accordance with the final SoCs and the conditions of approval. 328 The sustainability-related SoCs for the design and construction stages would therefore have taken on a mandatory status should the project have gone ahead. Interviewee SS2 explained that ‘what [SMA] did in the environmental assessment was have sustainability [objectives and initiatives] in the Statement of Commitments, because they get enshrined in law through the planning approval process’.

For the CBD Metro, sustainability related SoCs were grouped under governance, adaptation to climate change, GHG emissions and energy use, resource minimisation/recycling, water management and flooding, biodiversity, community benefit and sustainable office design. 329

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326 Interviewee SS2; Sydney Metro Authority, above n 239, 478.
327 Interviewee SS2.
328 Sydney Metro Authority, above n 239, 477.
329 Ibid 478.
For the West Metro, initiatives that would be implemented to avoid, minimise, manage, mitigate, offset and/or monitor impacts under each theme are discussed within each of the respective chapters, for example initiatives for GHG emissions are discussed in Chapter 20 of the West Metro environmental assessment report and include the use of photovoltaic cells to generate renewable power. However the specific chapter on SoCs for the West Metro cannot be referred to in this thesis because it was not published at the time the Sydney Metro project was deferred.

According to a number of interviewees, a significant achievement of SMA’s approach to governing infrastructure sustainability was getting these numerous initiatives embedded in the planning approvals process. As discussed, the SoCs reflected the sustainability objectives, targets and initiatives developed through the application of the SIR, and the Sustainability Management Framework more broadly. The key achievement of this activity is that the initiatives would have become part of the conditions of approval for the project. Hence in theory the successful contractors would have been required to undertake the initiatives, and the conditions of approval could have been used as a forceful driver (or ‘stick’) for the achievement of the related sustainability objectives, targets and initiatives.

However there is some commentary on issues associated with on-going monitoring and enforcement of mitigation and other measures specified in planning approval processes. These issues relate to the planning and environmental impact assessment process, an in depth analysis of which is beyond the scope of this thesis. However, in relation to ongoing enforcement of conditions of approval in the NSW context, interviewee SR1 observed that:

Enforcement will depend on how objective or clear the conditions of approval are. If they are too broad or subjective, measuring, monitoring and enforcement may prove difficult or near impossible.

Interviewee SR1 added that:

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330 Sydney Metro Authority, above n 243, 20-44.
331 Albeit that the author was able to view this chapter.
332 Interviewees SS1, SS3, SL2.
Legislation provides enforcement powers and the Department of Planning has an enforcement team. Although it is also supported by other agencies such as the NSW Department of Planning, Environment and Water, the enforcement team is arguably light considering how many projects it is now the approval authority for. And this list has still probably not peaked.

A further observation is that it is possible that prescribing infrastructure sustainability and initiatives through conditions of approval may be problematic because then they become ‘locked in’. Hence, they cannot be adapted or changed to reflect new technology, changes in stakeholder expectations, or feasibility ‘on the ground’ once the project is being constructed.

Considering the above issues associated with ongoing monitoring and enforcement of conditions of approval, should the Sydney Metro project contractors have failed to comply with any of the conditions relating to the initiatives, a lack of on-going monitoring and enforcement would mean that these non-compliances may not have been recognised. This would clearly detract from the achievement of getting the sustainability initiatives into the approvals process.

Whilst the author can not speculate on what the contractors’ performance would likely have been, interviewee SS1 did have some sentiments on this issue. Speaking about construction contractors more broadly, and not those relating to the Sydney Metro project specifically, this interviewee stated that ‘if [an initiative] is in the SoCs, it is legally binding [however] a lot of contractors will try to weasel out’. Talking in particular about the need for the bidding consortia to put forward a Sustainability Manager, interviewee SS1 added that ‘the SoCs say ‘you must have a sustainability manager with an appropriate qualification, experience and resources’, so [the contractor] might start with that person, and then six months later ... they put in someone more junior [because] they know how much room there is to move’. This issue is related to setting sustainability requirements in procurement processes.
6 Procurement Processes and Infrastructure Sustainability

(a) Background

The relationship between infrastructure sustainability and procurement includes procuring services, namely those of delivery partners, based on sustainability considerations, and embedding sustainability requirements into procurement and contract documentation. The purpose of doing so is to help the proponent realise desired sustainability outcomes by compelling suppliers (that generally provide materials) and contractors (that generally provide a service and/or labour, and in some instances materials) to address sustainability objectives, targets and initiatives throughout project delivery.

The data collected on SMA related primarily to the procurement of contractors and infrastructure sustainability, as opposed to suppliers. This was likely a result of the stage of delivery the Sydney Metro project was at when it was deferred. No construction materials from suppliers had been purchased at that time: hence interviewees and project documentation could not provide much insight into the nexus between suppliers and infrastructure sustainability. Further, most materials would have been procured by the successful consortia given their construction role in the public private partnership (PPP).

The proponent plays a critical role with respect to procurement and infrastructure sustainability because it has key decision-making power. Construction companies and other contractors will be contracted on a project by a proponent and will therefore need to comply with the contractual arrangements. To achieve infrastructure sustainability and sustainability outcomes, the proponent will need to establish its position on infrastructure sustainability and then translate it into contractual arrangements as ‘sustainability requirements’. This will include emphasising in request for proposal (RFP) documentation the contractors’ roles in delivering the desired sustainability outcomes.

RFP documents provide information on required services to which prospective contractors as ‘bidders’ or ‘tenderers’ respond. Once a bidder has been selected, a contract is drawn up in

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AGIC, above n 60.
CEEQUAL, above n 38, 11.
Ibid.
Klotz and Horman, above n 71, 596.
consultation with the successful bidder and other relevant parties, and based on the proposal documentation. Precise and clear written and verbal communication of desired sustainability outcomes is an important requirement of the proponent.338

Including sustainability requirements in RFP documentation is becoming more commonplace within the infrastructure industry.339 For example, the Queensland Department of Transport and Main Roads is developing key performance indicators to measure contractor performance in its procurement process.340 Contractual arrangements vary project to project but include design specifications that detail how the facility will be constructed and what it will look like.341

In addition to having sustainability requirements in RFP documentation, proposal evaluation frameworks should include assessment and scoring of the bidders’ responses to sustainability requirements. This could include evaluating past social and environmental performance of contractors and evidence of an environmental management system (EMS)342 or other environmental management mechanisms. Increasingly, proponents are recognising the need to include sustainability criteria when selecting contractors and other project employees on infrastructure projects.343 CEEQUAL, an assessment and awards scheme for improving sustainability in infrastructure projects, for example includes questions on proposal evaluation processes in relation to sustainability criteria in its assessment protocol, namely whether past environmental performance was considered in the contractor selection procedure.344

The type of delivery method is another key feature of procurement processes that has implications for infrastructure sustainability. Delivery methods range from ‘design and construct’ contracts to relationship contracts where parties work together as an integrated team, for example in an alliance. In the design and construct type models the different parties,

338 Hartshorn et al, above n 11, 177.
341 CEEQUAL, above n 38, 11.
342 See Part I Section A.
343 Kumaraswamy and Anvuur, above n 339, 999.
344 CEEQUAL, above n 38, 12.
including the proponent and principal contractors, are generally independent. In contrast an alliance is an incentive-based relationship contract where project parties agree to work together as one integrated team. The legal and commercial framework of an alliance not only enables the partners to work together to achieve the project objectives, it rewards all partners for achieving better than expected outcomes. There are disincentives to perform poorly and if the project performs poorly, all partners share the losses.

(b) Interface with Sustainability Objectives, Targets and Initiatives

SMA developed what some interviewees considered to be leading practice sustainability requirements in procurement processes. As discussed, the Sydney Metro project was deferred after the various bidding IMO and PRI consortia had submitted their proposals in response to the IMO and PRI RFP documentation for the CBD Metro, but before successful consortia had been selected. However, interviewees indicated that the proposals had been evaluated internally, and some interviewees discussed their views on the various responses to the sustainability requirements in these proposals.

The procurement documents of most relevance include for the IMO contract, the CBD Metro – Volume 1: General Information and Instructions to Proponents (IMO Volume 1), CBD Metro – Volume 2: Initial Information and Returnable Schedules (IMO Volume 2), and the CBD Metro IMO Section 2 – Preliminary Scope and Performance Requirements (IMO Performance Requirements). For the PRI contract, relevant procurement documentation included the CBD Metro – PRI-1 Works Conformed Version of Invitation to Tender for the Design and Construction of the Metro Line 1 (Stage 1) Permanent Route Infrastructure (PRI-

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346 Henneveld, ibid.

347 Interviewees SS1, SS2, SE2, SL2 and SS4.
1) and Design and Construction of PRI-1 Works – Scope of Works and Technical Criteria (Appendix 24 Project Plan Requirements) (PRI Project Plan Requirements). 348

Broad sustainability objectives are found in IMO Volume 1, IMO Performance Requirements and PRI-1. In IMO Volume 1, it is stated that SMA’s objectives for the IMO included to ‘deliver continuous sustainable transport and environmental outcomes on a whole-of-life basis in all aspects of the Integrated Metro Operations’ including proactively addressing opportunities for minimising energy use and maximising sustainability. 349 IMO Performance Requirements also include sustainability objectives for the IMO such as to ‘ensure the continuous application of whole-of-life and sustainability concepts in all aspects of the Integrated Metro Operations including the design, construction, maintenance, operation and hand-back phases’. 350 SMA also asserts in the introduction of these Requirements that ‘the IMO Project Company must prepare a sustainability strategy and initiatives that meet world’s best practice’. 351 Similarly, the PRI-1 included in a section on the objectives for the CBD Metro ‘applying best practice sustainability principles in the metro railway design’. 352

It is evident from these documents that SMA tried to communicate clearly the importance it placed on sustainability to the bidding consortia, and that sustainability was a key ‘value’ of the organisation. This was confirmed by interviewee SL1, who stated that ‘we [SMA] pushed [sustainability] as an objective all the way through our documents and we said to the contractors, yes it is important to us and you will be assessed on it’. This idea of sustainability being a value held by SMA was discussed by interviewee SL2 in the context of how SMA wanted to work with the successful IMO consortium:

348 All of these documents can be found on Transport NSW’s website <www.transport.nsw.gov.au/sites/default/file/metrodocs/> at 12 December 2010.
351 Ibid Section 1.2.
One of the very important elements [of the procurement process] was how can we work together? It is in fact a partnership. We were working on the basis of a operator who was going to operate the system for 30 years ... during that period of time you wanted somebody who is sharing [your] values ... otherwise it is pointless. You do have the ability to select individuals and companies which are committed to similar types of things as you are.

IMO Volume 2 specified the information and returnable schedules to be provided by each IMO bidding consortium. IMO Volume 2 Returnable Schedule 3.3 and PRI Project Plan Requirements Section 24.5 related to the development and submission of an initial Sustainability Plan. The initial Sustainability Plan requirements mirrored the SMA Sustainability Management Framework in many respects. The bidding consortia were required to develop sustainability policies and strategies, as well as initiatives under the different themes.\(^{353}\) For both the IMO and PRI contracts, the Sustainability Plan had to include processes and methodologies for embedding sustainability initiatives in design, procurement, construction, manufacturing, operations and maintenance processes; processes and methodologies for monitoring, auditing, corrective action, continuous improvement and reporting on sustainability performance; and an outline of the systems that will be used to support sustainability management.\(^{354}\)

Detailed targets were expected to be developed for the construction stage of the IMO works including for electricity consumption (in megawatt hours), fuel consumption (in gigajoules), embodied energy (in megawatt hours and gigajoules) of concrete and steel, carbon footprint, embodied environmental impact of concrete and steel, recycled content of both concrete and steel (in per cent), quantity of waste (in per cent of mass) to be recycled, and potable water consumption (in megalitres).\(^{355}\) Detailed targets were also expected to be developed for the service phase on similar impact or opportunity areas including electricity consumption (in megawatt hours), electricity generation from renewable and low-carbon sources (in megawatt hours), electrical energy recovery and re-use from regenerative braking, annual carbon


\(^{355}\) Ibid Returnable Schedule 3.3 – Initial Sustainability Plan, 24.
footprint, quantity of waste (in percent of mass) to be recycled, and potable water consumption (in megalitres).

As part of the Sustainability Plan requirements, the consortia were also required to detail their methodologies for undertaking various assessments, and estimating their targets, in accordance with various International Standard Organisation (ISO) standards and other standards, such as ISO 14040:2006 Environmental Management: Life Cycle Assessment, ISO 14064-2:2006 Greenhouse Gases (Parts 1, 2 and 3) and AS/NZ4360:2004 Risk Management for a climate change risk assessment, relating to the climate change adaptation theme. The contents of the Sustainability Plan were also laid out in the CBD Metro SoCs.

Sustainability requirements then appeared, and were embedded, throughout other sections of the procurement documentation. For example, in IMO Volume 2 – Returnable Schedule 5.1 relating to the Initial Design Management Plan, SMA stated that the Initial Design Plan ‘must identify key interfaces with other project plans including project management, quality, environmental management, sustainability and risk management’. In addition, in the development of the initial environmental management plan, the bidding consortia were required to ‘identify interfaces with other plans and in particular the Sustainability Plan [emphasis added]’.

Within the IMO Volume 2 returnable schedule relating to concept design, a Concept Design Sustainability Report was required to be developed. This report was to address and detail the status of the concept design against the sustainability initiatives and targets identified in the initial Sustainability Plan; corrective actions that would be taken if the design fell short of these sustainability targets; initial register of sustainability initiatives providing information on the identification and implementation of these initiatives; and the findings of the assessments conducted in accordance with the initial Sustainability Plan. This requirement for on-going monitoring and assessment of the implementation of initiatives links to SMA’s planned approach to measuring, monitoring and reporting discussed in Section 11 below.

358 Ibid Returnable Schedule 7.4 – Concept Design: General, 57.
Interviewee SS2 gave other examples of where sustainability appeared in the procurement documentation:

So there were a whole load of different [project delivery] packages, [for example] stabling, operations, civil works, track works, rolling stock. They all had their own little sustainability story to tell. So for the depot, [SMA said] you have to have green tracks, so grass way between tracks, water sensitive urban design ... you’ve got to have a design review process, 20, 30 per cent design. It has to include a safety check. It has to include an electrical check ... I made sure it had a sustainability check.

The intention was to embed, meaningfully and holistically, sustainability into project delivery through these procurement processes. Of particular importance was ensuring a consistent language throughout all relevant procurement documentation. According to interviewee SS2, there were between 100 and 200 documents per contract, namely the different PRI and IMO contracts. SMA ensured that every document had a consistent reference to sustainability. The documentation also linked to the environmental assessment reports, namely the SoCs which would have informed the conditions of approval. The contractors would have been obliged to comply with the conditions of approval resulting from the SoCs, as discussed in Section 5 above, and this was noted in the procurement documentation accordingly.359

Another key requirement in the Sustainability Plan, as outlined in the CBD Metro SoC, was the requirement for the bidding consortia to nominate a Sustainability Manager. This requirement also appeared in Returnable Schedule 3.1 of IMO Volume 2, which related to the organisational structure; and role descriptions, responsibilities and the minimum proposed qualifications, competencies, experience and skill levels of project team members including the Sustainability Manager.360 Within the PRI contracts, this requirement was found in Schedule 28 of the PRI-1 Project Deed that related to the contractor’s personnel. For the PRI contracts, specific requirements included that the Sustainability Manager had to have minimum 10 years relevant and demonstrable experience in infrastructure sustainability.361

359 Interviewee SS2.
The approach to get the bidding consortia to respond with their own targets is worth discussing in some detail. This is not an ‘input’ approach where the proponent specifies targets or methodologies to meet those targets. Instead, the proponent allows the ‘market’ (in the case of Sydney Metro, the private national and international companies bidding for the work) to respond and tell the proponent how they plan to implement the high-level sustainability objectives and values.\(^{362}\) In this approach, the bidding contractors must specify how they intend to meet the performance targets they have nominated, providing relevant supporting data to demonstrate that the proposed targets can be met. Interviewee SS2 explained that on the Sydney Metro project:

> The procurement team quite rightly said that you don’t really want to be asking, or specifying [the bidding contractors] to meet a target, [for example] 90 per cent use of demolition material ... Because you don’t know enough about the design and how [the contractors] are going to do things yet. So what you can do is have some initial targets from your reference design. But then say to the contractor, this is how we came up with that target. Now you come up with yours.

Along with the procurement documentation, SMA provided the SIR and the reference design including the sustainability objectives, targets and initiatives, requesting that the bidding consortia come up with their own.\(^{363}\) As outlined above, many of the SIR initiatives were incorporated in the reference design. The bidding consortia also had access to the CBD Metro SoCs, which included the various sustainability objectives developed by SMA, which they would have needed to align themselves with in responding to the sustainability requirements. According to interviewee SS4, a sustainability professional who worked for one of the consortia bidding for the IMO contract, there was a base case or ‘do nothing’ scenario, then there was the reference design provided by SMA through the PBACH advisers, and then the consortia had to effectively ‘beat the reference design again’.\(^{364}\) Interviewee SS4 provided more details on this process using an example:

> So in the reference design [SMA] estimated the total megawatt hours that were going to be used by the system. There was a base case, then there was the reference design, and then we came along, and

\(^{362}\) Interviewee SS4.

\(^{363}\) Interviewee SS4.

\(^{364}\) Interviewee SS4 was sourced and interviewed once the importance of the interface between infrastructure sustainability and procurement became apparent to the author. Unfortunately, the proposals submitted by the bidding consortia to the SMA could not be viewed by the author, so discussion is limited to one individual’s experience and perspective.
based on our design for the stations etcetera, we anticipated that we were going to use x number of megawatt hours, which was less than the reference design. So as part of that, we had to try to impress [SMA] saying “these are the things that you said, we agree with all of them, but we don’t agree with some, and these are the extra things that we will do” ... It was a lengthy register that we were going to maintain if we were successful in the bid.

So although there were only a few targets, such as the target to offset 100 per cent of operational emissions, required to be met by the bidding consortia, many of the initiatives in the SIR were connected to a quantitative amount (though not a target) as part of the reference design, which the bidding consortia had to improve upon.

The initiatives within the SIR were already qualitatively ranked by SMA on a one to five scale. One of the bidding consortia then did its own ranking of the initiatives in the SIR based on social, economic and environmental considerations. The consortia ranked all the initiatives between one and three and had a summary at the end outlining which initiatives gave the best social and environmental benefit, at the lowest cost. The initiatives went through a test of practicality, in terms of, for example, engineering feasibility, before making it onto the list where they were ranked by the consortia. According to interviewee SS1, the prioritisation process undertaken by SMA also happened organically. With respect to the target to offset 100 per cent of operational emissions, for example, it was viewed as an opportunity to mitigate and minimise arguably the biggest environmental impact and as such became the focus of advocacy efforts and resources.

(c) Proposal Evaluation

Also of relevance in IMO Volume 1 and PRI-1 is the inclusion of the proposal evaluation criteria. In IMO Volume 1, the evaluation criteria included, under the overall vision, business plan and approach section, ‘approach and commitment to the environment and sustainability’. In PRI-1, the evaluation criteria included the ‘embedment of sustainability

365 Interviewee SS4.
366 Interviewee SS4.
367 Interviewee SS4.
368 Interviewee SS1.
into the design and construction of the PRI-1 Works’. The need to address sustainability also came under the design and technical solutions section of the evaluation criteria. The importance of sustainability to the evaluation of the bidding consortia was confirmed by interviewee SL2, who stated that ‘in terms of all of our criteria for selection, the environmental and sustainability side was an important component’. None of the interviewees were able to give the exact weighting of sustainability in the proposal evaluation process for the Sydney Metro project, although interviewee SS2 suggested that ‘sustainability is never going to be more than five per cent of any decision on a tender. It’s probably more likely two or three, including environmental management...’

The responses to the sustainability requirements by the bidding consortia were, by and large, viewed as innovative and appropriate. According to interviewees SS2 and SE2, all of the bidding consortia responded ‘over and above’ what SMA asked on sustainability. Interviewee SS2 added that ‘what that says to me is that the market is more than ready [to deliver on infrastructure sustainability]’. This included the responses for both the IMO contract and the PRI design and construct contract. Interviewee SD2 had similar sentiments to interviewee SS2 in terms of the IMO tenderers, stating:

Although I wasn’t directly involved in [the sustainability] part of the tender review process, some of the feedback I was getting was that the IMO tenderers really embraced the sustainability initiatives. To some extent going over what we were proposing which was very encouraging.

(d) Bidding Consortia Views on Procurement Processes

Interviewee SS4 gave his personal views on SMA’s sustainability requirements and the general procurement processes in relation to infrastructure sustainability. He noted that he had never seen such detailed requirements on sustainability in RFP documentation, adding that ‘when I first saw the [sustainability requirements], I was impressed. It was really good to see the client pushing the boundaries, and asking the tenderers to come back and effectively

371 Sydney Metro Authority, above n 369, Section 10.1.
372 Interviewees SS2 and SE2.
try to ‘beat’ the reference design in terms of sustainability’. This interviewee also thought that the requirements were ‘reasonable’, and were ‘setting a very high bar’.

This interviewee also discussed how other bidding consortium team members responded to the sustainability requirements:

Everyone working on the [consortium’s] bid was amazed at how detailed a response was required for sustainability. Not a lot of people had ever seen contracts with such onerous conditions and responses required – but everyone was embracing it and people were sitting up and saying “we have to do this, this is now how it is done”.

Interviewee SS4 outlined the importance of the delivery method for infrastructure sustainability in terms of the IMO being a PPP. He suggested that the benefit of having such a contract was that the PPP had to operate the project for 25 to 30 years, so they would endeavour to put in ‘a fully functioning system that only requires a minimal amount of work [and] doesn’t give headaches in the future’. 373

Interviewees SE1 and SD2 concurred with this theory. The former suggested that the ‘incentive for having the [IMO] operate the asset for 30 years is that hopefully they would build it well from the start’. Similarly, interviewee SD2 remarked that ‘the incentive of the IMO contract is [that the contractors] are going to be interested on what is on the wall, what type of materials are on the floor, because they have to look after that product’. This has implications for infrastructure sustainability because the PPP may be more willing to invest in infrastructure sustainability initiatives based on whole-of-life thinking, for example sustainability-related technologies like energy efficient lighting that cost more upfront but save money in the long-term. 374

On the other hand, some commentators argue that other types of delivery methods, for example based on a design and construct contract, might hamper infrastructure sustainability, and in particular, innovation, because the contractors will not receive the benefits of going ‘above and beyond’, or being innovative. 375 As stated above however, this did not appear to

372 See also Shelbourne et al, above n 302, 64.
373 Scanlon and Hodgson, above n 46, 50.
be the case for the PRI contracts because the sustainability requirements were clearly communicated as important to SMA, and if a tenderer was to be successful, they would need to meaningfully address these requirements. Design and construct contracts are probably only unconducive where the proponent has not made infrastructure sustainability a key consideration in procurement processes. These issues are discussed further in Part V Section B(6).

7 Design Processes – Challenges and Overcoming Challenges

(a) Overview

There were numerous challenges facing SMA in relation to developing and implementing the approach to governing infrastructure sustainability. These challenges related primarily to the interface between the sustainability objectives, targets and initiatives, and planning, design and procurement processes. These challenges are discussed in this and the following section, including how they were, or were not, overcome.

(b) Design-related Decision-making for Sustainability

Interviewees discussed some challenges in terms of integrating infrastructure sustainability into the design processes. Interviewee SD2 discussed how initiatives ended up not being viable, or did not ‘make the cut’ when reviewed by certain leadership-level employees. He used the example of putting in tri-generation technology across the different stations, stating that ‘very early on we looked into tri-generation across the stations, but it didn’t get up because it was too out there. It is proven technology but it was possibly too risky’. He then went on to explain that:

A key issue is that large infrastructure projects are often difficult to get up, so there can be a perception that all the sustainability items can add significantly to the bottom line project cost,

376 Again, the quote from interviewee SL2 suggests this: ‘we [SMA] pushed [sustainability] as an objective all the way through our documents and we said to the contractors, yes it is important to us and you will be assessed on it’.

leading to a risk of it just not getting up ... At the end of the day, all projects have a budget, and any increase in the budget can put the whole project at risk of not getting built.

Another challenge was that some members of the leadership team wanted to go with the ‘quick and easy’ initiatives that might be good from a marketing and public relations perspective, but were not necessarily going to provide the best sustainability outcome.\(^{378}\) Interviewee SD2 gave an example:

> All of our stations were sub-surface, and were suitable for using grey water, for example for public or staff toilets. However, excavating a larger hole, fitting it out, maintaining and operating it etcetera to facilitate grey water in maybe three or four toilets per station, you have to question whether it is economical, and is that truly sustainable?

Other project team members wanted instead to implement initiatives that were going to have the most impact, and which SMA and the Sydney Metro project had the greatest ability to influence. For example, the target of offsetting 100 per cent of operational emissions was a result of a non-structured prioritisation process undertaken by sustainability advisers. Interviewees SS1 and SD2 explained that the operational emissions associated with running the rolling stock and powering the stations had the most significant environmental impact. Interviewee SL2 saw prioritisation as being about:

> Keeping your eyes on the prize ... identifying what are the important things to keep going with, and the not so important things to worry about. You can’t win every battle in these areas, but it is important to win the big ones.

The use of prioritisation as a decision-support tool in the context of the Sydney Metro project is discussed further in Section 10 below.

The issue of some key decision-makers wanting to go with the ‘quick and easy’ initiatives was overcome in part by providing a clear business case for those initiatives, including for renewable energy in operations associated with the 100 per cent target for offsetting operational emissions. This required market testing and research into feasibility, cost-benefit and other technical aspects as discussed in Section 10 below on decision-support tools. Also of importance was the role of the sustainability advisers in building solid relationships with

\(^{378}\) Interviewee SD2.
key decision-makers, namely those at the leadership-level of SMA, or as interviewee OS1 observed, ‘standing around in the office kitchen talking about sustainability with the CEO over a cup of tea’. The important role of the sustainability advisers is explored further in Section 9 below.

Time constraints were also a challenge for embedding infrastructure sustainability in design processes. According to interviewee SD2, the Sydney Metro project was run to a challenging time-line which put pressure on the design team, and that this pressure may have been amplified by the time needed to investigate sustainability initiatives. At the same time, however, interviewee SD2 also observed that the ‘architectural teams were very much for pushing the sustainability flag all the way along the project’. Interviewee SS3 observed that the willingness of designers to adopt infrastructure sustainability varied from individual to individual. These views can be summarised as a general appetite and willingness of the design team to adopt infrastructure sustainability, but that sustainability was not the key driver and centrepiece of decision-making where there were more pressing factors such as time constraints associated with a tight project program.

A further challenge was observed to be that at the early stages of design, not a lot of detail is known about the project, so it is difficult to come up with specific initiatives and targets.\(^{379}\) This ties into challenges associated with articulating sustainability requirements in procurement processes, as discussed below. Getting the design team ‘onboard’ was facilitated by a number of means, including having the Design Manager ‘force the issue on some of the [design] consultants’.\(^{380}\) The strong mantra for infrastructure sustainability that existed in SMA, as encapsulated in the Policy and driven by some members of the leadership team,\(^ {381}\) was also a key enabler.

8 Planning Approval and Procurement Processes – Challenges and Overcoming Them

There is little doubt that a key achievement for SMA in addressing and governing infrastructure sustainability was the way that the sustainability requirements were articulated

\(^{379}\) Interviewee SD2.
\(^{380}\) Interviewee SD2.
\(^{381}\) See Section 2 above and Section A(4) respectively.
in the planning approvals and procurement documentation. This is particularly true for procurement processes because, as one interviewee so eloquently remarked:

> The contracts are where the heart of it lies in the end [because] that is what you are asking to be built. They will only build what is in the contract. And so the contracts have to have it in, and be very clear about what you are trying to achieve. The thing about putting it in a contract is that it does very rapidly make sure that you start articulating very clearly what you want. Because you are asking someone to price it.382

Interviewee SL2 believed that ‘SMA would be best practice in [getting sustainability into the procurement documentation]’, adding that ‘there has been a lot of interest from other agencies on our contracting strategies around that process’. However the process of developing and implementing these sustainability requirements presented various challenges that needed to be overcome. These related to dealing with the employees responsible for procurement processes, articulating the requirements in a workable format, assessing the different responses to the RFP documentation, and quick time-frames associated with different project delivery processes.

Although some interviewees involved in procurement processes indicated that the ‘market’ responded well to the sustainability requirements, there were some difficulties in evaluating the different responses. When talking about the proposal evaluation process and in particular the role of the contractor’s Sustainability Manager, SE2 observed that

> Some responses came back with a construction environmental manager and I thought “they’re just not getting it” because we have a whole sustainability policy, it is not just managing a construction site ... So we made a point of saying that we want a sustainability person in your team, and [emphasis added] we want an environmental manager, so separating them out.

Interviewee SS2 discussed the challenge of evaluating proposals using an example of life-cycle assessment (LCA) methodologies:

> So your life cycle assessment says 100. This one says 150. This one says 1000. Well they’ve obviously used a different method to start with. So between the 100 and 150, well they’re using

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382 Interviewee SL2.
more materials and they’re not. But they have to because they have got a more efficient design ... so it really only gave us data and it was hard to differentiate between the proposals.

Another challenge for SMA was articulating the desired sustainability requirements in a workable format. This was difficult because of conventional procurement strategies. For example interviewee SS2 discussed how the procurement team was ‘going full steam ahead’, using a NSW Roads and Traffic Authority RFP template, which was ‘bumpy and old ... within nothing on sustainability’, adding that picking up and using a template from elsewhere was something that infrastructure employees typically did.

This issue of arguably outdated procurement strategies, and more specifically templates, appeared to be coupled with a culture of ‘why change?’ within the SMA procurement team, and other employees within SMA. According to interviewee SS1, many of the employees responsible for putting the procurement documentation together were conservative, and averse to doing anything differently to past practices. SS1 referred to this as a culture of:

Professional reluctance of “why would you do that? We’ve done it this way a thousand times and it works” ... They generally will look at something and say “oh, I haven’t done that on other projects its superfluous, pull it out”. They are generally engineers that just work on all the contracts. So ... there is a need for sustainability advocacy.

Interviewee SS4 had similar sentiments, suggesting that:

Procurement people struggle in their mind to work out the dollars for sustainability. Everything else is much more known. So they know how to price 100 cubic metres of concrete, but they don’t know how to price 100 cubic meters of concrete that has more recycled steel or recycled content in it. So for them there is more uncertainty in the pricing ... It is the fear of the unknown – so they say “we want to stay with what we know, if it is unproven and untried, we’re not going to go down that route”.

Interviewee SS2 added that ‘the old heads in Metro and elsewhere [said] we shouldn’t have asked those questions [relating to the sustainability requirements] because the market wouldn't know how to respond. They responded and with more’. These cultural issues were discussed as being an issue for the rail sector more broadly.383 When talking about the rail

383 Interviewees SS2 and SS4.
sector and sustainability, interviewee SS1 talked about the reluctance to do things differently to the status quo partly because the rail sector has conservative, inflexible safety and other standards. A specific example of this reluctance was given by interviewee SS1:

When we were getting involved with our first round of contracts, a group got in touch with me. GreenSkills is an initiative set up by several tiers of government ... The whole idea is to augment existing apprenticeships and traineeships for young professional training to incorporate green collar jobs essentially. So plumbers who get water efficiency and so on, office managers who get green procurement, that type of training ... When I put that forward for Metro the resistance I got just knocked my socks off – “no one would do that, why would we do that?”

Clearly not all of the SMA project employees were reluctant to adopt infrastructure sustainability, as discussed in Section A above.

The sustainability advisers, the organisation of whom is discussed in Section 9 below, therefore spent a significant amount of time ensuring that the sustainability requirements were meaningfully and appropriately articulated into the procurement documentation, \(^{384}\) as well as undertaking advocacy and education on sustainability to change the ‘thinking’ or perceptions of certain employees. Yeo observes that ‘people are quite capable of attaching different meanings to, and reaching different interpretations of, the same issue’. \(^{385}\) He believes that this is a problem of perception which is one’s view of things and events; and suggests that different views can result from cultural biases, preconceptions and idiosyncrasies of human actors. \(^{386}\) Changing the thinking and perceptions of some of the SMA project employees was raised as an important part of overcoming some of the cultural and attitudinal issues. Interviewee SS3 saw working with the varying degrees of knowledge and understanding of employees, as well as using appropriate language, as crucial, stating that:

Actually translating some of that esoteric sustainability ‘stuff’ into language that makes sense to [the employees] is important. I am talking about materials, and energy efficiency, the sorts of things that

\(^{384}\) Interviewee SL2.  
\(^{386}\) Ibid.
they understand. If you’re talking about sustainability they can glaze over, but if you’re talking about efficiency, then they totally understand what that means. So it is about changing thinking.

Interviewee SS2 concurred with this observation, stating that:

Putting [infrastructure sustainability] in terms that the technical guys understand is important – a lot of the guys designing the technical solutions, they get operational efficiency and they get the need to save energy because it is a cost issue. I want to save energy because it is an environmental issue but I don’t have to put it in environmental terms to get the technical guys across the line, I just put it in energy terms. It is finding the levers and the language that they understand.

There was also a degree of vigilance involved in overcoming the challenges presented by some of the project employees, with interviewee SS1 suggesting that ‘the gruff RTA-based engineers who write those contracts take everything out and then you have to push it and get it back in and that happens four or five times’.

These activities meant that the roles of the various sustainability advisers was an integral component of the SMA approach to governing infrastructure sustainability. The technical, advocacy, educational and other capabilities and attributes of the sustainability advisers was of particular importance, and is discussed further in the next Section.

The issue discussed above of difficulties in evaluating the different proposals is linked to another issue of how prescriptive initiatives need to be in planning approval, and other project delivery processes, such as procurement. If the initiatives are very open to interpretation, for example a simple ‘you must have a sustainability manager’ without specifying qualifications, experience and other attributes, there may be too much lee-way for those contractors to achieve the bare minimum, or less.\(^{387}\) This is where the need to ensure the contractors share the same values as the proponent, and in this case SMA, becomes crucial, as discussed by interviewee SL2 above. If the contractors share the same values as the proponent, and sustainability is one of those values, it can be expected that the contractors will continue to drive and deliver infrastructure sustainability.

On the other hand, as was the case for the Sydney Metro project, it is difficult to be prescriptive in the SoCs because the project is still in its early stages of development. The

\(^{387}\) Interviewee SS1.
specifics of the project, to be worked out during detailed design for example, have not been established. Further, even if the proponent develops an array of sustainability initiatives, some of which are quite detailed, during the reference design phase, these initiatives could be effectively ‘designed out’ during detailed design by the contractor responsible for detailed design because the project starts to look completely different to the ‘blueprint’ provided by the reference design. Interviewee SS2 further explained:

Based on my experience on Sydney Metro, next time I would tone down the intensity of some of the sustainability work that was done on the reference design. Because if you are spending all your [sustainability resources] on a reference design, like half a million dollars, and then get it to a contractor to build up the detailed design, it could end up totally different, with a totally different sustainability outcome.

It was suggested instead that it would be more valuable for a proponent to establish the boundaries for infrastructure sustainability at the early stages of planning and design, for example setting up the methods for the bidding consortia to do LCA of materials and climate change adaptation research, rather than actually doing the research that led to SMA developing specific targets and initiatives in the SIR.\textsuperscript{388} By specifying the methods, this could also address some issues associated with evaluating the different proposals. There would be a ‘level playing field’ for tenderers, and one proposal could be compared against the other with ease because they would both be using the same method and therefore their outputs would be presented similarly.

Interestingly, interviewee SD2 believed that the level of research that went into the sustainability targets and initiatives to inform the reference design and other procurement documents was needed. He believed that it was valuable to do this research in the context of the Sydney Metro project because it was ‘the first project of its kind for Sydney, so it was good to do that background to understand what is achievable in the marketplace’. It also allowed SMA to be a more effective decision-maker when it came to reviewing the IMO and PRI tenders because it already had a good handle on what initiatives and targets were achievable.

\textsuperscript{388} Interviewee SS2.
This ‘informing’ the proponent is imperative because if there is a lack of understanding, then the proponent might not know what to ask of the ‘market’ to begin with. This is particularly an issue for non-PPP contracts such as design and construct contracts, where there are fewer incentives for the contractors to adopt infrastructure sustainability, especially if it will make the tenderers proposal uncompetitive because initiatives are added that were not required by the proponent in the original brief.

SMA adopted the ‘output’ focused procurement approach which allowed for the contractors to respond with their own sustainability strategies and plans, including targets and methodologies for delivering on their nominated targets. However this may have meant that a significant amount of the resources spent by PBACH and the other sustainability advisers may have been redundant if the successful IMO consortium adopted a wholly different, albeit acceptable, approach to infrastructure sustainability than that of SMA. The approach would likely have been acceptable because the proposal was evaluated by SMA and sustainability was part of the proposal evaluation criteria. This issue suggests that more attention needs to be given to the allocation of sustainability resources and efforts, particularly in terms of which project delivery processes need sustainability input, and the level of that input.

One area evidently needing the allocation of resources and efforts is ‘mapping out’ the organisational structure, project delivery processes and timeframes, and ‘what is going on, when, and who is responsible for what’. This would require engaging a sustainability adviser very early in the project delivery phase, particularly since a challenge for the Sydney Metro project was trying to articulate sustainability into the different processes, many of which were happening concurrently and at a quick pace. Interviewee SS2 for example observed that at the same time the environmental assessment work was being done, the design and the procurement documentation was going ahead. This issue of short timeframes coupled with difficulties in articulating desired sustainability outcomes indicates that this mapping process is extremely important. In addition, by mapping out these processes it would also be possible to prioritise efforts – such as toward particular design activities –

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389 See Part V Section B(6).
390 See Section 6 above.
391 Interviewee SS2.
where the best outcomes can be achieved. It may not be possible, depending on the amount of sustainability resource, to embed infrastructure sustainability into every single process.\(^{392}\)

9 \hspace{1cm} \textbf{Roles and Responsibilities}

(a) Background

Assigning responsibility for certain infrastructure sustainability activities and for meeting certain targets to project employees is an important part of achieving sustainability outcomes. The organisational structure for sustainability relates to whether or not sustainability advisers have been engaged, where sustainability advisers sit in terms of work-streams, and their seniority and decision-making power within the organisation.

Assigning responsibility is important because without a specific role in infrastructure sustainability, project employees may not be able to provide useful contributions.\(^{393}\) Further, by assigning responsibilities, the issue of determining which employees are accountable for achieving sustainability outcomes can be overcome.\(^{394}\) Assigning responsibility is about clearly communicating desired sustainability outcomes to project employees so that they understand the importance of infrastructure sustainability – that their capacity is built by understanding what it is, and how it links into their day to day activities, and what they might already be doing on infrastructure sustainability.\(^{395}\) It also relates to utilising and being sensitive to the many disciplines represented in a project team, such as engineering and planning, by assigning sustainability targets and activities to meet those targets to employees best suited to undertake the task.

Assigning responsibility can encourage commitment, especially where it is written into employee contracts or part of employee performance evaluation. Such commitment is paramount because, as found in a study on improving waste management performance on building construction projects, ‘the commitment of project participants, including labourers, subcontractors, and general contractors, are more important... than new technologies or

\(^{392}\) Interviewee SS2.

\(^{393}\) Shen et al, above n 11, 65.

\(^{394}\) van Bueren and De Jong discuss difficulties in determining which actors are accountable for sustainability outcomes within the built environment more broadly. van Bueren and De Jong, above n 126, 547.

\(^{395}\) Zainul Abidin and Pasquire, above n 5, 276-77.
regulatory guidelines’. This also relates to the decision-making and knowledge sharing discussed below, in terms of attaining commitment through the education and empowerment of project employees.

(b) Organisational Structure for Sustainability

Although in theory all individuals at the senior leadership-level of SMA had responsibility for infrastructure sustainability performance, it was largely the responsibility of the General Manager Station Precincts and Planning Approvals’ (GM Planning). Reporting to the GM Planning was the Senior Manager Environmental Compliance (Senior Manager Environment) who had responsibility not only for environmental planning, regulatory and other environmental issues relating to the project, but also for infrastructure sustainability. The Manager Environmental Sustainability, who was instrumental in developing the governance structure for infrastructure sustainability for SMA, reported to the Senior Manager Environment, although the Senior Manager Environment was engaged shortly after the Manager Environmental Sustainability. The Manager Environmental Sustainability was akin to a corporate sustainability manager role that exists in many organisations. According to interviewee SS1, the Manager Environmental Sustainability was conceived by the GM Planning in recognition of the need to pull together the infrastructure sustainability already underway on CBD Metro by the PBACH sustainability advisers, and consolidate it into an overarching SMA approach to governing infrastructure sustainability. The overall organisational structure for the sustainability advisers and their relationships to key positions is highlighted in Figure 6.

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397 Interviewees SS1 and SL2.
FIGURE 6 – Organisational structure of sustainability advisers

The PBACH sustainability advisers came from the consultancies forming part of the consortium – ARUP and Parson Brinkerhoff. The PBACH sustainability advisers were working on the early design stages of CBD Metro project before the Manager Environmental Sustainability role was created and filled. Their role included working with the design engineers to develop infrastructure sustainability initiatives to inform the development of the reference designs, and they reported to the Manager Environmental Sustainability and the SMA Design Manager. They also undertook the research and technical studies that informed the draft Sustainability Report. PBACH sustainability advisers also developed and applied the SIR. According to interviewee SS2, the PBACH sustainability advisers were technically capable, and some of the advisers came from a design background.

Although the sustainability advisers sat underneath the GM Planning, and then the Senior Management Environment, it was still identified as a separate work stream. As interviewee SL1 asserted:

[Sustainability] is a separate work stream – it’s not tucked into environment, it’s not tucked into design ... My view about sustainability is that environment and sustainability while closely related are not the same. Particularly environmental outputs such as planning approvals and other things – there are very strong synergies between the two, but you can break the two apart. They can be run by the same guy, but my view is that when you set up the project, you can have a sustainability champion.
The job title ‘Environmental Sustainability Manager’ is therefore somewhat at odds with the actual approach adopted by SMA, because the role did not deal with environmental issues alone, but dealt with infrastructure sustainability, and specifically the governance of it, in a holistic sense.

(c) Roles and Responsibilities Matrix

SMA was in the process of developing an infrastructure sustainability Roles and Responsibilities Matrix when the project was deferred. This Matrix intended to assign responsibility for sustainability initiatives, targets and outcomes to individuals from each tier of management. The level of responsibility varied depending on the individual’s level of involvement with sustainability objectives, targets and initiatives.

Senior leadership-level responsibilities included ensuring the Sustainability Policy was adhered to by SMA and contractors; establishing, monitoring, reviewing and reporting against sustainability targets and indicators annually; and ensuring continuous improvement against these targets. The Environmental Sustainability Manager’s responsibilities included monitoring performance against targets and indicators; preparing new targets for executive approval; formulating new initiatives; and reporting. The Communications Manager’s responsibilities included promoting the sustainability position and benefits to, and gaining support from, key stakeholders. Office Managers were responsible for internal, office based sustainability performance including reducing and collecting data on energy and water consumption and waste. Site Managers were responsible for site sustainability performance including procurement of goods. Finally, Design Managers’ responsibilities included ensuring the Sustainability Policy was adhered to in day to day project delivery activities and that contractors also adhere to the Policy; establishing, monitoring, reviewing and reporting against sustainability targets and indicators annually; and ensuring continuous improvement against these targets.398

SMA also considered incorporating sustainability key performance indicators into employee’s expectations in terms of their contracts, as well as into rewards systems. However, a full-time workforce had not been engaged as part of SMA, but rather consultants

398 Sydney Metro Authority, above n 184, Section 14.2.
were acting in short-term contracts or roles to mobilise SMA and the Sydney Metro project. There were many temporary roles until long-term positions could be developed and filled, and SMA as an organisation was described by one interviewee as being of a ‘fluid nature’ during the early stages of its mobilisation. Therefore the sustainability-related key performance indicators and reward systems had not been fully developed at the time the Sydney Metro project was deferred.

(d) Sustainability Advisers – Attributes, Roles and Responsibilities

As discussed above, the sustainability advisers were critical to developing and implementing the approach to governing infrastructure sustainability, and overcoming the various challenges that faced in particular the procurement aspect of this approach. The topic of desirable attributes, and roles and responsibilities, of the sustainability advisers arose as a central theme in nearly all of the interviews conducted for this case study.

Interviewees in the leadership group of interviews were particularly vocal on the issue. For example interviewee SL2 reflected on the roles of the sustainability advisers, stating that they had ‘specialist knowledge about things ... and looked at mechanisms, market processes, and everything else ... for example the cost-benefit assessment of introducing something’. The same interviewee discussed the importance of having the sustainability advisers embedded both in the design team, as per the PBACH sustainability advisers, and also within the SMA itself, as per the Environmental Sustainability Manager. This was seen as important in ‘affecting the Sydney Metro view’ on infrastructure sustainability, because the Manager was embedded in the proponent organisation and as a consequence could be more influential with the other project employees and delivery partners, as opposed to sitting outside of the proponent organisation which was viewed as undesirable. As interviewee SL2 suggested, ‘having an internal [sustainability discipline employee] is very important because from a status point of view it signals within the organisation that sustainability is very important’.

399 Interviewee SS1.
400 Interviewee SS2.
401 Interviewee SS2.
402 See above; See also Jane Scanlon and Adam Davis, ‘The Role of Sustainability Advisers in Developing Sustainability Outcomes for an Infrastructure Project: Lessons from the Australian Urban Rail Sector’ (2011) 29(2) Impact Assessment and Project Appraisal 121, 127.
403 Interviewee SS2.
Interviewee SL1 also discussed the role of sustainability advisers more generally, but also in the context of the Sydney Metro project. He remarked that:

[The sustainability adviser] asks the hard questions and says, why can’t we do this, what can we do with that? The sustainability [adviser] isn’t necessarily an expert in low energy lighting. He is not going to say, here is a solution. What he will do is say to the electrical engineer, “what measures have you taken? When you came up with this scheme, have you looked at different options? How have you assessed what is the best one?” They should be there as a prompt, as a coach.

This was somewhat conflicting with interviewee SS2’s suggestions about the roles and responsibilities of the sustainability advisers. He argued that ‘you’ve got to have [sustainability advisers] that actually know what they’re talking about at the design level and the construction level and not just at the governance level’, referring to the need for individuals with technical capabilities in design and other areas. Whereas interviewee SS1’s comment suggests that ideally the employees need to be adept at educating, advocating and change management.

The task of embedding the sustainability advisers lies primarily in the hands of the leadership team. If a proponent views sustainability as being important, they will very likely incorporate sustainability advisers into core decision-making processes.\textsuperscript{404} Whereas if they don’t see it as important, they might leave the sustainability advisers outside of the core project organisation, where it is quite difficult to implement sustainability policy because it is not seen to be a priority.\textsuperscript{405}

The sustainability discipline interviewees discussed their roles and responsibilities on the Sydney Metro project. For example, interviewee SS3 talked about the tasks of capacity building, facilitating learning and innovation, and internal networking in the context of working with the design team on infrastructure sustainability. Interviewees also discussed desirable personality traits and attributes including being ‘thick-skinned’ and ‘dogged and

\textsuperscript{404} Interviewee SS3.
\textsuperscript{405} Interviewee SS3.
tenacious’, and the importance of respecting the needs and interests of other project employees.

Interviewee SL1 suggested that the sustainability advisers need to be ‘proactive, have a series of engagements and have some activities where they can be seen to be doing things on a regular basis’. Interviewee SL1 also described what he perceived to be undesirable attributes of sustainability advisers, although did not indicate that any of the Sydney Metro project employees demonstrated such characteristics:

The key to being a good sustainability [adviser] is being a pain, but not a nasty pain. The good ones do more of a coaching and mentoring role. The worst types are those that say: “it’s this way or the highway”. I describe it as the sustainability zealots. No one likes a zealot. And on the delivery side, given a chance to fight, we are happy to have a fight, even if we don’t believe in it. If you have a zealot who says we are going to do it this way, the delivery guys are used to dealing with much bigger fights and uglier people than the sustainability manager. It’s a relationship thing.

Interestingly there was some difference of opinion between two of the leadership-level interviewees on the resources needed in terms of sustainability advisers. Interviewee SS2 was of the opinion that SMA would have benefited with more employees. He added that:

[The sustainability advisers] got over-worked ... in a sense what they [were] trying to do is a very big job. And especially at the front end of the project there is a lot of work trying to influence design and all of those sorts of issues that start coming out. You need to articulate that stuff very quickly. So just having a few more resources around would help.

On the contrary, interviewee SL1 suggested that it is ‘hard to justify a sustainability adviser full time, because it’s not a full time job, it’s one or two days a week’. This indicates the need for a clear understanding and agreement over the roles and responsibilities of the sustainability advisers, and the resources to be invested in, and by, these employees.

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406 Interviewee SS2. Interviewee SS2 added that ‘you have got to chase people, as well as be a go-to person, because people will not come to you ... you cannot expect that people are going to listen to you. You cannot expect that people are going to take onboard what you have given them. You have got to check it’.

407 Interviewee SS2.
10 Decision-support Tools

(a) Background

To achieve infrastructure sustainability it is necessary to integrate sustainability considerations into decision-making processes. This requires making decisions based on social and environmental dimensions in addition to economic, as well as based on the complex interactions between all three dimensions and their interaction with project delivery processes, over both the short-term and long-term. According to Vanegas ‘in a sustainable approach to facilities and civil infrastructure systems, all decision-makers integrate sustainability ... within their decision-making processes at all stages of the [project] life cycle ...’ The notion of integration between and within environmental, social and economic dimensions lies at the heart of the sustainability concept.

The concept of trade-offs highlights the importance of integrating social, economic and environmental dimensions into decision-making processes. This concept was defined in Part I, Section B, as being a circumstance where achieving a positive outcome in one dimension happens at the expense of one, or both of the other dimensions. An example is where purchasing renewable energy for the operation of an urban rail network might increase the price of a rail fare, discouraging people from using the network, so that seeking a good environmental outcome happens at the expense of social and economic dimensions. Another example is if the use of recycled materials in construction compromises the durability and therefore long-term functionality of a project, with clear economic implications. The latter issue was raised by interviewee SD2 in the context of the Sydney Metro project:

[The design team] wanted to introduce fly-ash to reduce virgin and high embodied energy materials. We needed to look at what impact that would have on the strength of the concrete, the life-expectancy etcetera. All of our structures needed to be 100 year life. There were a lot of issues around that.

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408 Mukherjee and Muga, above n 44, 4.
410 Vanegas, above n 15, 5364.
411 Gibson, above n 30, 260-261.
412 Scanlon and Davis, above n 402, 128.
When considering the environmental, social and economic implications associated with an activity across the life of a project, trade-offs can become transparent. When trade-offs are transparent, decision-makers can develop explicit rules about what trade-offs are acceptable, ideally in consultation with key project stakeholders.

Decision-support tools are critical for integrating sustainability into decision-making processes and achieving sustainability outcomes. These tools will vary depending on the project delivery process in question. For example, computer simulations and product research may be needed to inform sustainable design process decisions. Cost benefit analysis, which assesses potential economic benefits along with their costs, may be used to provide sufficient information on the benefits and limitations of using a technology. Life-cycle assessment (LCA) tools developed by industrial ecologists to evaluate the environmental impacts of products and services during all phases of their life might be used in the selection of materials for construction such as concrete. Risk assessment approaches might be needed to better understand potential climate change impacts and implications for a project.

(b) Sydney Metro Authority Approach

Under each of the 10 sustainability themes, the sustainability advisers used various tools through which to develop the approach. These support tools became integral to overcoming various challenges to implementing infrastructure sustainability on the Sydney Metro project.

The sustainability advisers developed working and technical papers. These papers were used as decision-support tools and resources for SMA and the PBACH team, informing the consideration and inclusion of key initiatives outlined in the SIRs. The papers provided a description of the initiatives, examples of successful applications on other projects (or

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412 Kemp et al, above n 5, 16.
413 Hill and Bowen, above n 30, 227; Kemp et al, ibid 15.
414 Magent et al, above n 95, 67.
416 McConville and Mihelcic, above n 93, 939.
417 There are many risk assessment standards and guidelines applicable to infrastructure projects including the Australian and New Zealand Standard on risk management AS/NZS 4360:2004.
418 Interviewee SS1.
‘benchmarking’), analysis of relative costs and benefits (and ‘value for money’) of the initiatives, and design guidance. Key initiative areas targeted for papers included carbon management, low carbon and renewable energy, energy efficiency, climate change risk assessment and adaptation, water management, integration of bikes and green roofs and walls.

An example is the paper produced on low carbon and renewable energy for operations. Initially, the PBACH sustainability advisers produced the paper which included an analysis of energy options, such as building a wind farm, for operation of the CBD Metro. This work formed the basis for the development of a policy position on low carbon and renewable energy for operations, negotiated with key decision-makers to be 100 per cent for operations for the CBD Metro. This would have been a significant sustainability outcome for the Sydney Metro project because ‘the single biggest operational impact was the use of energy and where energy came from’. The low carbon and renewable energy paper was quite detailed and went through a robust peer review process comprising three separate external expert parties. Other initiatives that were likely to cost more money or change the project also had to go through a review process.

The low carbon and renewable energy paper included modelling of additions to project cost over time, thereby linking in with the principle of whole-of-life thinking. According to interviewee SS2, the modelling demonstrated the long-term viability and monetary benefit of adopting the 100 per cent renewable energy target, based on estimates that fossil fuels will increase in cost over time, and renewables will decrease in cost as regulation, technology and other changes occur.

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420 Interviewee SS2; Sydney Metro Authority, above n 243, 8-8-14.
421 Sydney Metro Authority, ibid.
422 Interviewee SS1; Ibid 8-6-7.
423 Interviewee SS1.
424 Interviewee SS1.
425 Interviewees SS1, SS2, SS3, SL1, SL2.
426 Interviewee SL2.
427 Interviewee SS1.
Demonstrating value for money in these papers was critical because if an initiative is not economically viable, it has ‘fallen over at the first hurdle’. Understanding the true cost of initiatives is a key challenge to implementing an approach to governing infrastructure sustainability. Typical project funding structures are focused on impacts on upfront capital costs, as oppose to costs across the whole of the project life. This can be attributed to the fact that it is usually the proponent investing their private capital in the project, or the capital of a financial institution to which they are answerable. As some infrastructure sustainability initiatives, such as energy efficiency measures, cost more upfront, trying to convince a proponent to invest more at the onset when cost of construction is high is problematic, even when there are demonstrated long-term cost savings and other benefits. Because sustainability is inherently about the long-term, the focus on impacts on capital costs is a key issue. The dynamics between capital cost and infrastructure sustainability will vary depending on the procurement or delivery method. As discussed above, a PPP based project team might be more prepared to invest in sustainability initiatives that will reduce operational costs over the longer term.

There is also pricing ‘failure’ when it comes to costing the environmental and/or social impacts of benefits associated with infrastructure sustainability. A good example of this is the human health benefits associated with enhancing biodiversity and green space. These benefits are not captured by traditional economic models. Such issues are beyond the scope of this thesis, although there is a lot of literature on the need to challenge these traditional economic models that are typically unconducive to the sustainable development of society.

The sustainability advisers had the role of informing the key decision-makers at the leadership-level of SMA, thereby facilitating sustainable decision-making for sustainability.

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428 Interviewee SS2.
429 Scanlon and Hodgson, above n 46, 50.
430 van Bueren and De Jong, above n 126, 551; Vanegas states that ‘achieving the vision of built environment sustainability requires the implementation of mechanisms to expand the scope of what [a] project encompasses: from the narrow scope of delivery of the project within a start, a duration, and a finish, in response to a set of project drivers, to a complete life-cycle perspective ...’ Vanegas, above n 15, 5366.
431 See above Section 6.
outcomes. Their role of researching the different technical, cost and other issues associated with specific initiative areas was considered important and valuable.\footnote{Interviewee SL2.}

Another decision-support tool was benchmarking. Benchmarking involves looking internationally and nationally and seeing what activities and initiatives are being successfully implemented on other projects, such as in energy efficient technology and design, and then relating it back to the project in question.\footnote{Scanlon, above n 35.} It also relates to providing real-life examples of the benefits associated with implementing certain activities and initiatives. A study done by Zainul Abidin and Pasquire for example looks at the need for facilitators of value management exercises to provide real examples of where integration of sustainability has benefited other projects or clients to ‘bring confidence to clients on sustainability issues’.\footnote{Zainul Abidin and Pasquire, above n 5, 281.}

On the Sydney Metro project, according to interviewee SS2, ‘we learnt very quickly ... that any initiative that was put forward had to have demonstrable benchmarking to say this is just done everywhere else ... So we had to have a lot of research around each initiative’.

The types of projects and organisations included in the benchmarking exercise for the Sydney Metro project included Hong Kong Mass Transit Rail and New York’s metro system.\footnote{Interviewees SS2.}

Interestingly, benchmarking was accompanied by what was known as the ‘three rule’, which related to the level of ‘appetite’ to take on risk. According to interviewee SL1, ‘the three rule asked, ‘well has it been done in at least three other places around the world?’ If it has, then we can run with it, if it has not, we should not consider it ... it was all built around the ethos of leading not bleeding edge’.

Interviewee SL2 had similar sentiments:

One of the issues we decided very early on with Sydney Metro was that we wanted to use tried, tested systems internationally ... we didn’t want to actually develop a new system, where the risk issues are very high. And there are very good systems that are currently in use and have been proved. Now whether they are at the forefront in terms of sustainability practice, they may not be. In that case you would say ... we are not necessarily leading the world, but we are certainly at best...
practice at the moment. Whereas some other systems, other parts of it you might say well no, we actually want to try to do something new, something different.

An example of a specific initiative that underwent benchmarking was regenerative braking.\textsuperscript{437} A benchmarking exercise revealed that best practice for regenerative braking saves 21-22 per cent on operational energy for traction power.\textsuperscript{438} But there are also regenerative braking systems that will save up to 27-28 per cent, which would be leading practice. However such systems are less proven and therefore SMA did not want to adopt them. According to interviewee SS1, SMA didn’t want to risk using a system that saves more operational energy, when they knew that 21-22 per cent was still best practice and had been proven elsewhere.

Benchmarking was therefore critical in overcoming issues associated with perceived risk and cost. Interviewee SL1 considered benchmarking to be valuable for proving to key decision-makers within the NSW Government that the budget for a sustainability initiative on a project is justified: ‘if I go to the Minister and say, ‘look I need you to spend an extra 10 million dollars, and here’s the reasons why’. And he says, ‘well this sounds unusual, where else has it been done’, and we say ‘well actually it hasn’t been done’ ... you must be credible to sell the concept’. Interviewee SL1 had a solution to the issue of additional costs to a project due to sustainability initiatives, suggesting that ‘instead of saying to the Minister, ‘here’s the project, we want to make it green and you will need to pay this much’ ... we build it in, and build it in the price. Build it in as a core part of the project’. This comment suggests that getting sustainability objectives, targets and initiatives into the early stage of project delivery where the funding profile is established is critical, as well as asking contractors to price their sustainability initiatives so there are ‘hidden’ or unexpected costs for proponents, and sustainability initiatives are not ‘cut off’ due to lack of resources.

Interviewee SS4 also discussed the importance of benchmarking in getting project team members over the ‘fear of the unknown’. He suggested that the rail sector in particular was reluctant to try new technologies, and that as a ‘sustainability professional, it is very useful to draw on where things have been done in other countries to demonstrate that it works, in a similar environment’.

\textsuperscript{437} See above footnote 243 for definition of regenerative braking.
\textsuperscript{438} Interviewee SS1.
SMA also started to develop sustainability performance assessment tools for specific project components. These sustainability performance assessment tools were to be consistent with established tools, namely the Green Building Council of Australia’s Green Star rating system. Specifically, SMA adapted provisions in the Green Star rating system for its stations, ancillary buildings and tunnel design activities. The tools were to establish a series of overarching benchmarks for sustainable design, and were developed in collaboration with design specialists. However, a copy of these draft tools could not be obtained for the purposes of this research.

With respect to the Australian Green Infrastructure Council (AGIC), there was a suggestion that SMA was considering joining the organisation, but had not done so at the time the Sydney Metro project was deferred. In June 2010, the membership was over 60 companies and government organisations from planning, design, construction, operation, finance and legal disciplines. AGIC’s scheme is voluntary, and comprises seven categories and 27 subcategories identified and agreed upon by members to assess infrastructure sustainability and sustainability outcomes on projects opting for an assessment. AGIC’s sustainability performance rating tool had not been developed when the Sydney Metro project was still alive. Hence, it is difficult to speculate whether or not SMA would have adopted the tool at later stages of project delivery.

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439 Sydney Metro Authority, above n 243, 8-8-14.
439 Interviewee SS1; Sydney Metro Authority, ibid 8-6. The Green Star tool is an environmental rating system for buildings developed by the Green Building Council of Australia. For further information see <www.gbca.org.au/green-star/> at 12 March 2011.
440 Sydney Metro Authority, above n 243, 8-8-14.
440 Interviewee SS1; Sydney Metro Authority, ibid 8-6.
441 Interviewee SS1.
442 Interviewee SL2.
11 Measuring, Monitoring and Reporting

(a) Background

Achieving sustainability outcomes requires not only setting objectives and targets, but also establishing or selecting indicators through which to measure, monitor and report progress toward those objectives and targets. Indicators can be defined as:

Figures or other measures, which enable information on a complex phenomenon like environmental impact to be simplified into a form that is relatively easy to use and understand. The three main functions of indicators are quantification, simplification and communication.444

The selection of performance measures is of particular importance because ‘what gets measured is what is likely to get managed in due course of time’.445 Measuring, monitoring and reporting should be an iterative process that is adaptive to changes in technology, stakeholder expectations, and other issues.446

Many infrastructure sustainability performance assessment tools featuring in the literature provide sets of indicators, or methods for establishing sets of indicators, through which to measure, monitor and report progress on infrastructure sustainability; few of which have been applied on real-life infrastructure projects.447 Indicators of relevance can therefore be found in existing sustainability performance assessment tools, typically separated into the categories of infrastructure sustainability including water, energy and climate change.

Indicators can also be found in the Global Reporting Initiative (GRI) separated into social, economic and environmental dimensions.448 GRI is a widely used voluntary sustainability

444 ISO-21929:2006 Sustainability in Building Construction – Sustainability Indicators – Part 1: Framework for Development of Indicators for Buildings, 6. Indicators can also be defined as ‘a parameter or a value derived from parameters, which provides information about a phenomenon ... Indicators possess a synthetic meaning and are developed for a specific purpose’. A Warhurst, ‘Sustainability Indicators and Sustainability Performance Management’ (2002) 43 Mining, Minerals and Sustainable Development, 10.
446 Hill and Bowen, above n 30, 233; George, above n 257, 183. Ugwu et al state that ‘some indicators are vulnerable to the vagaries and changes in society’s priorities’, above n 80, 249.
447 See Part I, Section A(3).
reporting framework for reporting on an organisation’s economic, environmental, and social performance.\textsuperscript{449} GRI reflects the Triple Bottom Line (TBL) reporting concept first coined by John Elkington from the company SustainabAbility in 1994. The TBL reporting concept was developed with the belief that sustainability dimensions would need to be more wholly integrated if real environmental progress was to be made.\textsuperscript{450} As Elkington himself puts it, ‘in the simplest terms, the TBL agenda focuses corporations not just on the economic value that they add, but also on the environmental and social value that they add – or destroy’.\textsuperscript{451} The term was developed to appeal to businesses, being an extension of the ‘bottom line’ concept.\textsuperscript{452}

Indicators not only allow for the project employees to measure and monitor progress toward sustainability objectives and targets, but provide a means to report to internal and external stakeholders. Reporting is extremely important, particularly if key drivers for adopting infrastructure sustainability include community or other stakeholder interest and expectation. If the proponent is a government organisation, there will likely also be mandatory reporting requirements, for example equal employment opportunity reporting and the Department of Environment, Climate Change and Water’s Waste Reduction and Purchasing Policy reporting in NSW, which could be dovetailed with sustainability objectives, targets and the development of a reporting framework. Evidence suggests that in Australia, reporting on sustainability issues is undertaken by some contractors using the GRI framework.\textsuperscript{453} GRI presents a well-known, established and consistent means of reporting, but some commentators argue that GRI is too broad to communicate effectively on infrastructure sustainability, because of its specific and unique issues.\textsuperscript{454}

An important reason for measuring, monitoring and reporting on infrastructure sustainability and sustainability outcomes is for updating and improvement. For example, through

\textsuperscript{449} Global Reporting Initiative, ibid 3.
\textsuperscript{451} Ibid 3.
\textsuperscript{452} The ‘bottom line’ refers to the economic and financial performance and imperatives of an organisation.
\textsuperscript{453} Carmichael and Balatbat, above n 21, 7.
\textsuperscript{454} Kumaraswamy and Anvuur, above n 339, 1000. However, more recently GRI has produced ‘supplements’ to its traditional reporting framework, including for the construction and real estate sector, which may prove more appropriate for reporting on infrastructure projects.
measuring and monitoring processes it would be possible to identify which sustainability objectives and targets are being met, and whether they need to be revisited to reflect contemporary practice, technology or stakeholder expectations, or to identify gaps in information or data used to measure progress. These processes are therefore also critical for achieving continuous improvement, as a key principle of infrastructure sustainability.455

(b) Sydney Metro Authority Approach

As the Sydney Metro project was deferred at relatively early stages of project delivery, the process for measuring, monitoring and reporting was in its developmental stage and had not been practically applied. However, a review process was being formulated which warrants discussion.

Of particular relevance was the review process proposed for measuring, monitoring and reporting progress against targets, and the targets against the policy positions and best practice. This process was to incorporate legislative and other changes in the revision of targets, and drive continuous improvement in infrastructure sustainability.456 The review process would have been a key role of the Environment Sustainability Manager (see Section 9 above). When discussing the review process, interviewee SL2 remarked that ‘in the end what I expected to have was a sustainability assessment at the end of the design process which said ... “this is what you said you were going to do [as per the SIR], this is what you did, [and] these are things you should try to do to improve the process next time”’. Sustainability indicators through which to measure progress toward sustainability targets were to be negotiated during the process of procuring contractors (see Section 6 above). However it was noted that the indicators would have been broadly consistent with the AGIC’s sustainability performance rating tool once the tool was developed.457 Reporting on infrastructure sustainability progress was to be on an annual basis consistent with the GRI reporting protocol.458

455 See Part I Section B(2).
456 Interviewee SS1.
457 Ibid; Sydney Metro Authority, above n 184, Section 14.2.
458 Ibid; Sydney Metro Authority, ibid.
There was also an assessment mechanism being developed to track progress of sustainability initiatives. It would have helped ensure that initiatives developed during the early design stages by PBACH and SMA were actually ‘ticked off’ at later or detailed design stages by the contractors that had committed to those initiatives through procurement processes. It would have questioned, and made transparent, decisions to either progress or reject an initiative. As interviewee SL2 explained:

I was very keen that there was a checking process at the end of the design process so that we could demonstrate that we achieved our original objectives. I wanted to make decisions to either drop it, or to change it, or to proceed with it, transparent. So it wasn’t just something where we said “we had all these great sustainability objectives” and then you get to the end and say “now what happened to that one where we said you should be doing a depot which is totally recycling water? I notice that in the new design it doesn’t happen anymore”.

This mechanism to track progress, as well as the many sustainability targets and some initiatives to be locked into conditions of approval as per Section 5 above, would have helped to ensure that initiatives were not effectively ‘designed out’ or eliminated in the name of budget savings\footnote{Pulaski et al, above n 71, 89. This would only be an issue for those initiatives that incur additional upfront costs, as opposed to those discussed in Part I Section A(2) that present an environmental and/or social benefit and upfront cost savings, and are therefore ‘win-wins’.} or in value management exercises as discussed above; or in the name of simplifying the construction process.\footnote{Pulaski and Horman, above n 299, 1275. This is discussed further in Part V Section B(4).}

12 Knowledge Sharing and Capacity Building

(a) Background

Knowledge sharing and capacity building relates to promoting a sustainability culture.\footnote{A sustainability culture can be defined as an organisational state of awareness, learning, values and practices for sustainability.} This implies information sharing amongst employees about infrastructure sustainability experience on past projects, sharing information on infrastructure sustainability and sustainability outcomes with the broader industry and other external stakeholders, and increasing the
capacity of project employees and external stakeholders to understand and adopt infrastructure sustainability.\textsuperscript{462}

There are various types of project activities and exercises that enable knowledge sharing and capacity building. They include training programs to enhance the sustainability knowledge of project employees and other stakeholders,\textsuperscript{463} workshops where experience on past projects is shared amongst workshop participants,\textsuperscript{464} presenting at industry forums such as conferences on project sustainability outcomes and practice, and on-going engagement with project employees on sustainability outcomes and practice by sustainability advisers.\textsuperscript{465} There is also a role for incentive schemes that encourage a ‘culture’ of sustainability on a project.\textsuperscript{466} For example, Shen et al state that ‘construction professionals find limited effectiveness without encouragement or incentives’, and suggest that incentive schemes be implemented to achieve sustainability outcomes.\textsuperscript{467}

The importance of knowledge-sharing and capacity building for infrastructure sustainability is discussed by numerous commentators. The concept of ‘network influences’ for adopting sustainable technologies including information sharing among project owners and professional associations has been developed.\textsuperscript{468} Shen et al state that ‘only [when] all project stakeholders share the same information and knowledge of the project sustainability performance [can they] work together towards achieving better project performance’.\textsuperscript{469} The importance of knowledge sharing on a project for developing technical and innovative solutions is also discussed in the literature.\textsuperscript{470}

Of critical importance for knowledge sharing and capacity building is effective communication and collaboration on a project. Collaboration for infrastructure sustainability can be internal or external.

\textsuperscript{462} AGIC, above n 60.
\textsuperscript{463} Shen et al, above n 11, 66.
\textsuperscript{464} Scanlon and Davis, above n 402, 130.
\textsuperscript{465} See in general ibid.
\textsuperscript{466} See Part IV Section B(11).
\textsuperscript{467} Shen et al, above n 11, 61.
\textsuperscript{468} Mukherjee and Muga, above n 44, 10.
\textsuperscript{469} Shen et al, above n 7, 279.
\textsuperscript{470} Demaid and Quintas, above n 96, 606; van Bueren and De Jong, above n 126, 553.
Internal collaboration refers to intra-project collaboration, or bringing together design, engineering, marketing and other disciplines or work-streams.\textsuperscript{471} Shen et al state that ‘the effectiveness of applying various methods ... for sustainable construction practice is determined by the effectiveness of the level of collaboration among project participants’.\textsuperscript{472}

External collaboration refers to interfacing between the project and external stakeholders such as the community, industry, government and academia.\textsuperscript{473} Collaboration is imperative for building support and commitment.\textsuperscript{474} Without collaboration there can be no common understanding of what is needed for sustainability outcomes. Effective external collaboration requires engagement and consultation with community and other stakeholder groups. This is important for promoting more optimal design solutions and enhanced job satisfaction, for example through new learning opportunities.\textsuperscript{475}

Similar to the procurement, and reporting and responsibilities sub-categories, adequate communication is crucial to this sub-category. There is a critical need to develop an efficient communication framework among project employees in order to enable knowledge-sharing.\textsuperscript{476} Dewberry and Monteiro de Barros use the term ‘dialogue’ in the context of communicating on sustainability, stating that ‘dialogue is vital in drawing out what is important and motivating for people in constructing a meaningful response to sustainability’.\textsuperscript{477}

Knowledge sharing can have positive implications past assisting in the achievement of sustainability outcomes. For example, in sustainability-related workshops, there may be employees from various disciplines participating, and it may be one of the only times such different disciplines interact. In this situation, the workshop can act as an effective knowledge creation and transfer tool, and other project-related issues or problems can be discussed and potentially solved.\textsuperscript{478} In addition, in a workshop environment the process of giving and

\textsuperscript{471} Hartshorn et al, above n 11, 177.
\textsuperscript{472} Shen et al, above n 11, 65.
\textsuperscript{473} Hartshorn et al, above n 11, 177.
\textsuperscript{474} van Bueren and De Jong, above n 126, 553.
\textsuperscript{475} Hartshorn et al, above n 11, 177.
\textsuperscript{476} Shen et al, above n 11, 66.
\textsuperscript{477} Dewberry and Monteiro de Barros, above n 51, 32.
\textsuperscript{478} Scanlon and Davis, above n 402, 130.
absorbing information is faster and more effective because you have everyone in one place at one time.  

Building the capacity of project employees to understand sustainability is critical. For example in the case of engineers, Mirza states that ‘engineers need a lot of work to fully comprehend ‘sustainability’ and ‘sustainable development’ and to develop new technologies, along with changes in basic values and political thinking, to incorporate these concepts into the design process.’ Capacity building on infrastructure sustainability also needs to happen outside of the scope of the infrastructure sustainability governance structure for a particular project, namely in education systems relating to engineering, project management and other project related disciplines. Capacity building is also about empowering project employees, and Dewberry and Monteiro de Barros outline the importance of empowering individuals in order to drive sustainability.

(b) Sydney Metro Authority Approach

The ‘fluid’ nature of SMA at the early stages of project mobilisation not only had implications for the engagement of sustainability advisers, but also for knowledge sharing and capacity building. It was explained by interviewee SS1 that because there was not a full-time workforce, it would have been imprudent to invest resources in this area because the temporary nature of the workforce meant that the knowledge would not have been retained within the organisation.

For example at the early stages of project mobilisation, the Environmental Sustainability Manager set up a sustainability working group comprising employees from various workstreams, and held a few workshops through which to share knowledge, and develop possible sustainability initiatives. Again, however, because these positions were in general temporary, the workshops were largely ineffective in ‘building organisational knowledge and

479 Zainul Abidin and Pasquire, above n 5, 277.
480 Mirza, above n 48, 640.
481 See for example Schafer and Richards, above n 296, 150; Mirza, ibid 647. See also above footnote 296 and accompanying text.
482 Dewberry and Monteiro de Barros, above n 51, 32.
483 Interviewee SS1.
Part III Section B

corporate memory, or [sustainability] culture’.\textsuperscript{484} Although on-going, formal workshops did not take place on the Sydney Metro project, the importance of workshops, as outlined in the preceding Section, is discussed further in Part VI. This capacity building took place less formally by the sustainability advisers as discussed in Section 8 above, in terms of mobilising and shifting the thinking and understanding of certain employees such as in the procurement team.

Other ideas for undertaking initiatives and activities such as building a sustainability culture, and sharing information and infrastructure sustainability and sustainability outcomes, were being developed. SMA had conversed with the NSW Department of Environment, Climate Change and Water (DECCW) about its Sustainability Advantage Programme, which helps to capacity build organisations on sustainability, particularly in the context of the corporate office.\textsuperscript{485} This would possibly have been implemented once SMA had its fulltime workforce, as would the concept of ‘green teams’ of employees who looked after the office in terms of recycling waste, reducing energy and water consumption, community contribution and other sustainability issues.\textsuperscript{486} Capacity building also took place more ‘organically’ as part of the sustainability advisers’ roles and responsibilities in playing an advocacy role, as discussed in Section 9 above.

13 Key Findings

This section summarises the key findings from the SMA case study pertaining to the approach to governing infrastructure sustainability, and how key challenges were overcome. These key findings are compared and contrasted with those from the ODAT case study in Part V. A framework for governing infrastructure sustainability is presented in Part VI based on theory developed in the comparative study.

\textsuperscript{484} Ibid.
\textsuperscript{485} For further information see the NSW Department of Environment and Climate Change’s website Sustainability Advantage <www.environment.nsw.gov.au/sustainbus/sustainabilityadvantage.htm> 20 February 2011.
\textsuperscript{486} Interviewee SS1.
(a) Get in Early in Design and Build in Flexibility

In terms of design processes and the interface with SMA’s approach to governing infrastructure sustainability, there was a focus on addressing and exploring possible sustainable design initiatives from the very early stages of design. This was championed by the SMA Design Manager, and facilitated and managed through weekly design meetings and the SIR. Building flexibility into design was a key consideration, as was the responsible selection and use of materials. Challenges associated with design processes included that some leadership-level employees wanted to go with ‘quick and easy’ sustainability initiatives that were not necessarily going to provide meaningful sustainability outcomes.

(b) Consistently Integrate Sustainability Requirements and be Non-Prescriptive where Appropriate

The sustainability requirements in the procurement documentation set a benchmark in terms of level of information required from the bidding consortia on their approach to infrastructure sustainability. A key feature of the approach was that it was integrated throughout the procurement documentation. This sent a consistent message and would likely have ensured that infrastructure sustainability was embedded in the numerous project delivery processes and their specific activities. The ‘output’ or non-prescriptive focused requirements was a good approach because it allowed the market to respond, thereby encouraging innovation; and evidently the bidding consortium did respond ‘over and above’ what was expected.

There was a suggestion that a better approach to procurement would be for the proponent to assign fewer resources to developing the targets and initiatives as part of the reference design, and instead formulate the methodologies for the bidding consortia to develop their targets and general approach. This might simplify the proposal evaluation process which did present somewhat of a challenge on the Sydney Metro project. Recommendations for developing sustainability requirements are provided in Part VI following the comparative study with ODAT’s approach to, and experience with, sustainability requirements in procurement documentation. Also of interest in relation to procurement processes is that the PPP delivery method to be used on the Sydney Metro project would likely have encouraged the IMO contractor to adopt infrastructure sustainability, based on whole-of-life thinking.
(c) Embed Sustainability Objectives, Targets and Initiatives into the Planning Approvals Process

Embedding the various sustainability objectives, targets and initiatives as well as the approach to governing infrastructure sustainability more broadly into the planning approvals process was another key ‘win’ for SMA. It gave more impetus to the sustainability requirements in the procurement documentation – supporting the clear message that infrastructure sustainability was important to the SMA and it was to be a key consideration in the delivery and operation of the project. However, issues associated with the planning approval process, and more specifically ongoing monitoring and enforcement of mitigation measures specified through approval processes, may have diluted this achievement should the project have gone ahead.

(d) Engage Sustainability Advisers with Desirable Attributes and Assign Appropriate Roles and Responsibilities

Sustainability advisers having the right attributes, as well as well defined roles and responsibilities, are crucial ingredients in effectively governing infrastructure sustainability and in overcoming challenges. For example, articulating the procurement sustainability requirements and navigating the tight time-frames associated with project delivery processes were overcome through adept sustainability advisers. These employees played an advocacy and educational role, and ‘pushed’ the infrastructure sustainability agenda throughout the different work-streams, and in particular the procurement team. They also acted as a prompt to other team members to undertake infrastructure sustainability. The sustainability advisers had to have the right technical capabilities when needed, for example in informing the reference design; and the inconsistency between the opinions of SL1 and SS2 on the roles of these employees suggests that any sustainability discipline employee must take care to understand the individual team members’ expectations of them, as well as respect their needs and interests.

(e) Use Decision Support Tools to Demonstrate Feasibility of Initiatives

Sustainability advisers also had a role in applying various tools to inform decision-making processes. Such tools included value for money assessments of different initiatives,
articulated in the working and technical papers, and benchmarking exercises. A process of prioritisation also happened organically, where energy use during operations – the project activity that would result in arguably the greatest impact – was targeted for mitigation. Key findings in relation to decision-support tools include that economic viability is an important consideration. Costs needs to be considered where possible in the context of the whole life of the project, as well as in the context of environmental and social impacts and opportunities traditionally not priced. Also of importance is the need to demonstrate the feasibility of initiatives by providing evidence that they have been applied successfully elsewhere. The SMA experience indicates that decision-support tools are critical for overcoming challenges associated with effectively implementing an approach to governing infrastructure sustainability, including those associated with risk aversion.

(f) Track the Development and Implementation of Initiatives

Although the project was deferred before a measuring, monitoring and reporting mechanism was in place, the SMA experience suggests that this is an integral part of an approach to governing infrastructure sustainability. Of particular importance is tracking the development and implementation of initiatives and ensuring there is a mechanism in place to make individuals, teams or contractors answerable for any deviations. In terms of knowledge sharing and capacity building, the project was deferred before a structured process could be put in place, although the advocacy role played by many of the sustainability advisers would likely have resulted in the capacity building of some project employees.

While these key findings are important and relevant to the research objectives, SMA’s approach materialised because there was genuine commitment to infrastructure sustainability and sustainability outcomes. This commitment was a result of the various drivers for infrastructure sustainability discussed in Section A above, the most critical of which is leadership-level appetite at the level of general manager and above. Where a proponent organisation does not have leadership-level interest and appetite, it may be more difficult to develop an effective approach to governing infrastructure sustainability, such as articulating meaningful sustainability requirements. This is simply because sustainability resources, including positions for sustainability advisers, may not be deemed necessary or sought after in the first place.
C  Conclusion

Part III has responded to the research questions pertaining to the SMA case study. The key drivers for addressing infrastructure sustainability have been discussed and included legislative and policy drivers, the nature of the Sydney Metro project as a transformational product, and leadership-level and project employee appetite. SMA’s approach to governing infrastructure sustainability was then described, including key challenges to implementing this approach and how they were overcome. The key findings arising from the case study were then summarised. The next part details the ODAT case study in the context of the research questions, followed by a comparative study of the two case study approaches to governing infrastructure sustainability in Part V.
IV CASE STUDY – OLYMPIC DELIVERY AUTHORITY (TRANSPORT DIVISION)

A Infrastructure Sustainability Drivers

1 Overview

This section addresses the first research question pertaining to the key external and internal drivers for addressing and governing infrastructure sustainability in the context of the Olympic Delivery Authority (transport division) (ODAT) case study. The information has been compiled from a review of project-related documents and the interview process, supported where appropriate with existing literature. These internal and external drivers can be separated into the nature of the Games as a transformation product, especially in relation to the focus on legacy outcomes; community and other stakeholders; legislation and policy; and leadership-level appetite.

2 A Transformational Product and Legacy

The Olympic Delivery Authority (corporate) (ODA) is committed to delivering the ‘most sustainable Olympic Park ever’, ensuring that it is a blueprint for sustainable regeneration and a catalyst for the long-term transformation of a deprived and degraded part of East London. Environment and sustainability is one of six high-level ‘political’ construction commitments made by ODA. The vision for the Games is to create healthy, vibrant, equitable and well designed local communities. This will be done by creating new compact communities that have access to a range of infrastructure and services such as local employment, public venues, schools, open space, and transport. ODA’s focus on creating a transformational development overall drives infrastructure sustainability on individual projects, including via

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487 See above Part II, Section A.
488 Olympic Delivery Authority, above n 202, 8; Whittaker et al, above n 206, 17.
489 Other commitments include quality and functionality, safe and secure, and on time. These commitments were documented and signed off at the senior leadership-level. Interviewee OS2.
490 Whittaker et al, above n 206, 16.
ODAT on projects such as Orient Way. Infrastructure sustainability outcomes are a priority, along with traditional project drivers such as time, cost and fit for purpose.\textsuperscript{491} Sustainability and infrastructure sustainability more specifically was an important feature of the Games bid. Within the bid, sustainability was ‘the cornerstone of the Games’.\textsuperscript{492} The London 2012 Chairman, Lord Sebastian Coe, was quoted as saying ‘sustainability was an important element of our bid and underpins our preparations and our vision for the legacy of London 2012’\textsuperscript{493} The strong commitment to sustainability made in the Games bid has influenced ODA to develop systems and processes for sustainability, including relating to the delivery of infrastructure projects as part of the Games. Interviewee OL1 explained that ODA’s ‘corporate [sustainability] targets are driven by the promise made in the [Games] bid that these would be the most environmentally friendly Games ever’. More detail on London 2012’s sustainability commitments and objectives, and how they interface with ODA and ODAT’s sustainability objectives and targets – and overall governance approach to infrastructure sustainability – is discussed further in Section B(3) below.

It was not only the concept of sustainability that was pushed through the bid, but the notion of legacy, defined in Part II Section C. The London 2012 team determined early on that development would be driven by the ideal long-term use and infrastructure needs of the site, as opposed to looking solely at the requirements of the Games.\textsuperscript{494} The Games infrastructure was therefore planned after considering and planning for the longer term. According to interviewee OS2, approximately 300 million pounds is being spent on the transformation of the area and long-term legacy. This commitment to legacy has given a boost to infrastructure sustainability, as long-term outcomes are generally at the forefront of decision-making, including for transport infrastructure projects. According to interviewee OS1, this ‘legacy thinking really drives individuals within ODAT’. Further insights into the link between legacy and infrastructure sustainability are provided in Section B(13) below, and Part V Section B(11).

\textsuperscript{491} Olympic Delivery Authority, above n 207, 1.
\textsuperscript{492} Interviewee OS2.
\textsuperscript{494} Interviewee OS2.
OTA’s focus on legacy planning and outcomes has been driven by the media, the community and other stakeholders. And because, as discussed above, OTA’s commitment to legacy is resulting in infrastructure sustainability and sustainability outcomes, community and other stakeholders can be viewed as significant drivers for addressing infrastructure sustainability.

Olympic Games in general often receive negative publicity. Examples include in relation to stadiums and other developments, which become unused ‘white elephants’ post Games, and cases where local communities have been displaced or otherwise disadvantaged. The London Evening Standard published an article on 6 February 2009 titled the ‘2004 Olympic Legacy that London Must Avoid’. It showed a photo of the basket ball stadium in Athens from the 2004 Olympic Games surrounded by rubbish and demonstrating its isolation and disuse. The article discussed the negative legacy left behind by Athens and how the London 2012 Games needed to avoid this. Numerous other media articles and articles by non-government organisations criticising Olympic Games in legacy and sustainability terms have been published. OTA’s focus on legacy planning appears a direct attempt to avoid such negative publicity by aiming to ensure that ongoing environmental, social and economic benefits result from the Games, and importantly, from the use of public money.

The delivery and operation of the Games involves a number of stakeholders that have an existing sustainability agenda. For example, the Games fall within the jurisdiction of the Greater London Authority, which is the city-wide governing body for London. The Mayor of

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495 Whittaker et al, above n 206, 13.  
498 See Part II Section C.
London is the key decision-maker within the Authority. The Authority’s sustainability agenda is strong and includes a sustainable procurement policy,\textsuperscript{499} sustainable design and construction planning guidance,\textsuperscript{500} and objectives relating to the achievement of sustainable development in section 30 of the Greater London Authority Act 1999.

In ODA’s Sustainable Development Strategy, discussed further in Section B(2) below, it is stated that the Greater London Authority is a key ODA stakeholder and is ‘responsible for maximising the economic, social, health and environmental benefits the Games bring to London and all Londoners’.\textsuperscript{501} As a key stakeholder to the Games coupled with its sustainability mantra and activity, the Greater London Authority has been a driver for the ODA to adopt infrastructure sustainability. Other key stakeholders with a sustainability agenda include the World Wildlife Fund and BioRegional, discussed further in Section B(2) below, and the Environment Agency.

According to interviewee OS1, ODAT has generally aligned its sustainability commitments with its key transport delivery partners such as Transport for London (TfL) and Network Rail. ODAT has worked with TfL’s sustainability unit to ensure its projects address TfL’s sustainability policies and requirements.\textsuperscript{502} However, much of the infrastructure sustainability on ODAT’s projects has been driven by ODA’s strong sustainability agenda, as opposed to by the transport delivery partners.\textsuperscript{503} This is not surprising because to date the urban rail sector has been slow in taking up and implementing infrastructure sustainability due to various reasons, including those discussed by Scanlon and Hodgson.\textsuperscript{504} Issues associated with the urban rail sector’s appetite and capacity for infrastructure sustainability are discussed further in Part V Section B in the context of the research findings.

In terms of legislative provisions relating to sustainability, section 4(3) of the Olympics Act titled ‘general functions’ states that ‘in exercising a function under this section the


\textsuperscript{501} Olympic Delivery Authority, above n 202, 6.

\textsuperscript{502} Interviewee OS1.

\textsuperscript{503} Ibid.

\textsuperscript{504} See in general Scanlon and Hodgson, above n 46.
Authority shall, wherever relevant ... have regard to the desirability of maximising the benefits to be derived after the London Olympics from things done in preparation for them, and ... contribute to achieving sustainable development’. In its Sustainable Development Strategy, ODA identifies these provisions as a driver for infrastructure sustainability and sustainability outcomes.  

4 Leadership-Level Appetite

Leadership-level appetite for infrastructure sustainability and sustainability outcomes is also a key driver for ODA and ODAT. This appetite would have stemmed from the aforementioned sustainability commitments made in the original bid for the Games. There is also evidence that the Chief Executive Officer (CEO) of ODA has been extremely committed to sustainability outcomes. According to Whittaker et al, ‘an important success factor for the sustainability of the London 2012 Games is leadership from ODA’s CEO David Higgins and his steadfast commitment to a sustainable Games’. Interviewee OS2 added that ODA’s ‘CEO has been excellent ... legacy has been very important to him’.

At the leadership-level within ODAT, the Head of Transport Systems and Games Safety, who as a senior employee has key decision-making power, is also committed to sustainability outcomes. This employee has been instrumental in promoting infrastructure sustainability within ODAT, and ODA more broadly, for example in championing the requirement for contractors to apply CEEQUAL, an assessment and awards scheme for improving sustainability in infrastructure projects, as will be discussed further in Section B(6) below.

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505 Olympic Delivery Authority, above n 202, 5.
506 Whittaker et al above n 206, 22.
B Approach to Governing Infrastructure Sustainability

1 Overview

This Section addresses the second and third research questions pertaining to ODAT’s approach to governing infrastructure sustainability, and the key challenges relating to this approach, and how these challenges were overcome. As with the SMA case study, the overall structure of the approach is discussed, and the interfaces between the approach and design, planning, and procurement processes is given special attention due to the significance of these interfaces. Challenges with respect to design and procurement are then discussed. Again as with SMA, the remainder of this Section is separated into roles and responsibilities; decision-support tools; measuring, monitoring and reporting; and knowledge sharing and capacity building. A final section discusses the importance of legacy in ODAT’s approach to governing infrastructure sustainability.

Because ODAT operates in relative autonomy of ODA, the analysis focuses on ODAT’s approach to governing infrastructure sustainability. However, there are still some interfaces between ODA and ODAT’s sustainability activities which need to be discussed, for example in relation to sustainability objectives, targets and initiatives; and measuring, monitoring and reporting. It is therefore important to note when ‘ODA’ is used and when ‘ODAT’ is used – the former relates to ODA’s corporate sustainability activities and approach, and the latter to ODA transport division’s sustainability activities and approach specifically.

2 Overall Structure

This Section provides an overview of the top level structure for governing infrastructure sustainability in terms of ODA and the London 2012 team, namely in relation to key documents. It then provides more detail on ODAT’s overall structure for governing infrastructure sustainability, which largely centres on its Sustainability Management System (SuMS).

\[507\] See Part II Section A(4).
At the bidding stages of the Games, the sustainability vision for the Games was encapsulated in ‘Towards a One Planet Olympics’ developed in partnership with the World Wildlife Fund and the organisation BioRegional.\footnote{Olympic Delivery Authority, above n 202, 8; Interviewee OS2.} This vision reflected the ten principles of One Planet Living which are zero carbon, zero waste, sustainable transport, local and sustainable materials, local and sustainable food, sustainable water, natural habitats and wildlife, culture and heritage, equity and fair trade, and health and happiness.\footnote{These principles aim to provide a framework to enjoy a high quality of life within the productive capacity of the planet, World Wildlife Fund, The Ten Principles of One Planet Living \url{http://wwf.panda.org/what_we_do/how_we_work/conservation/one_planet_living/about_opl/principles/} at 4 December 2010.} However, it was determined that this approach was limited in terms of practical application, and subsequently the London 2012 team developed their sustainability vision and principles further.\footnote{Interviewee OS2.}

The overarching sustainability governance documents for the London 2012 team are the London 2012 Sustainability Policy and the London 2012 Sustainability Plan published in 2007. The London 2012 Sustainability Plan has a program-wide commitment to sustainability across all venues and Games-related activities, and sets out activities through which to realise outcomes. The London Organising Committee of the Olympic Games (LOCOG) and ODA are the two bodies that are required to comply with the policy and plan. ODA then has a Sustainable Development Strategy that describes how ODA intends to deliver infrastructure sustainability and legacy outcomes while complementing its other objectives including delivery on time and achieving value for money.\footnote{ODA has developed a Sustainability Management System (SuMS) to deliver on the commitments and requirements of the Sustainable Development Strategy. SuMS is based on British Standard (BS) 8901 and ODA was one of the first organisations to achieve the standard.\footnote{Lloyd’s Register Quality Assurance, ODA Breaks New Ground with Sustainability Award for 2012 Transport Plans (May 2010) \url{www.lrqa.co.uk/news/Client/oda.aspx} at 5 January 2010.} BS 8901 is a management system standard, which is defined as a system to establish policy and objectives and to continually achieve those objectives.\footnote{Sustainable Event Solutions (BS 8901), Background \url{www.sustainableeventsolutions.com/BS8901WhatIsIt.aspx} at 30 November 2010.} It was first published on 30th November 2007 and was revised and re-issued in September 2009. BS
8901 is currently being developed into ISO 20121, the International Standard for Event Sustainability Management.\textsuperscript{514}

BS 8901 shares common management system principles and processes with ISO 9001 standard on Quality Management and ISO 14001.\textsuperscript{515} For example, like ISO 14001, BS 8901 involves a commitment to policy and the use of that policy as a basis for establishing a plan. The plan sets objectives and targets for improving performance, and continuous improvement is an expected outcome. These and other processes are outlined in Figure 7 below. This figure can be compared to Figure 8 also provided below, which outlines the ‘road map’ for the implementation of BS 8901, as specified in the Standard. The ‘road map’ incorporates ISO 14001 principles and processes, but provides more detail on what is involved in developing and implementing a sustainability management system as per BS 8901.

**FIGURE 7** – Common management system principles and processes\textsuperscript{516} These principles and processes are reflected in ODAT’s SuMS as discussed throughout Section B

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\textsuperscript{515} ISO 14001 was introduced in Part I Section A.

As indicated in Figure 8 and as will become apparent in the discussion below on ODAT’s SuMS, a management system based on BS 8901 is not simply an extension of an environmental management system (EMS) to consider the social and economic dimensions of sustainability, which as discussed in Part I Section A, would likely prove problematic. Rather, it supports a more sophisticated, integrated approach to managing sustainability issues, albeit that it is designed especially for the sustainable management of events.

**Figure 8** – A ‘road map’ for the implementation of BS 8901. This road map is reflected in ODAT’s SuMS as discussed throughout Section B

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**PHASE 1**

1. Define policy for sustainability.
2. Identify and engage stakeholders (including supply chain) as part of the planning process.

**PHASE 2**

1. **Implement**: provide resources and competencies, manage the supply chain and maintain communications, document the system.
2. **Check**: monitor and evaluate against key performance indicators.

**PHASE 3**

1. Review and feed forward.

BS 8901 requires organisations to understand the sustainability issues relevant to all aspects of their event, including infrastructure delivery, operation and decommissioning, and to put in

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517 Martin Smith, An Introduction to ISO 14001 and BS 8901 (2008) <www.consultmartin.co.uk/pdf/Introduction%20to%20ISO%2014001%20%20BS%208901%20(06.03.08).pdf> at 13 April 2011, 1.
518 See Part V Section B(2) for discussion on the applicability of BS 8901 to the framework developed in Part VI.
519 Adapted from Eventia, BS 8901 – An Overview <www.eventia.org.uk/dyn_data/files/BS8901overviewandmemberfeedback.pdf> at 13 April 2011.
place measures to control and minimise impacts.\textsuperscript{520} It requires organisations to aspire to continually improve their sustainability performance in relation to the management of events. BS 8901 does not require actual performance benchmarks to be met. Instead it requires demonstration that a robust system is in place for achieving sustainability outcomes.\textsuperscript{521} This is consistent with the head of the International Federation for Consulting Engineers (FIDIC)’s Sustainable Development Taskforce Peter Boswell’s suggestion that standards for project sustainability management should avoid ‘prescribing the objectives that an organisation should achieve or specific performance requirements that should be met’.\textsuperscript{522}

SuMS is intentionally embedded in ODAT’s operations, including that of the rail delivery arm, and forms part of an integrated Sustainability, Safety, Health, Environment and Quality Management System (SSHEQ). It is therefore integrated with other ODAT processes including for risk assessment and management, and stakeholder engagement.\textsuperscript{523} According to interviewee OS1, the SuMS ‘has provided a structured approach to identifying and managing the full spectrum of sustainability issues’. He added that ‘it takes it a stage further from ... ISO 14001 environmental management systems standard ... combining some of the social elements [as well]’.

BS 8901 was rolled out across the whole of ODA after it was implemented by ODAT. However, because ODA is not involved in the operational stages of the Games and it has completed the delivery of its infrastructure, SuMS is more relevant to ODAT.\textsuperscript{524} SuMS is not only of relevance to the delivery of transport infrastructure but also to ODAT’s role of facilitating transport operations during the Games.\textsuperscript{525} It has the commitment of the Head of Transport Systems and Games Safety who reports into the London 2012 Heads of Function. It is kept up to date through internal audits and independent verification. ODAT’s SuMS is

\textsuperscript{520} Interviewees OD1 and OS1.
\textsuperscript{521} Interviewee OS1.
\textsuperscript{523} ODAT’s Sustainability Manager draws from – and is required to comply with – the ODA Communications Strategy and Code of Consultation produced by the ODA Communications Team when facilitating communications with internal and external stakeholders, Olympic Delivery Authority Transport, ‘SSHEQ Management System – Procedure S2.25 Sustainability Management System’ (Report, Olympic Delivery Authority, 2010) emailed to author 19 July 2010, 15.
\textsuperscript{524} Interviewees OS1 and OL2.
\textsuperscript{525} Olympic Delivery Authority, above n 523, 4.
discussed further in the proceeding sections as it relates to procurement processes; the
organisational structure for sustainability; measuring, monitoring and reporting; and
knowledge sharing and capacity building.

Other documents of relevance to infrastructure sustainability and ODAT include the
Transport Plan for the London 2012 Olympic Games and Paralympics Games (Transport
Plan) which has a section on sustainable transport, and includes principles such as developing
an ‘accessible network’ to ensure that spectators with all forms of impairment are able to
access venues.\textsuperscript{526} The Transport Plan has fed into ODAT’s overall infrastructure
sustainability commitments, and objectives, targets and initiatives, as discussed in the next
section.

3 Sustainability Objectives, Targets and Initiatives

As discussed in Part III Section B(3) targets are the more quantitative measure and objectives
the more qualitative measure for achieving a certain sustainability outcome. Above the level
of sustainability objectives and targets, the London 2012 Sustainability Policy names five
headline sustainability themes of climate change, waste, biodiversity and ecology, inclusion,
and healthy living. These themes represent the priority sustainability themes across the entire
Games program.\textsuperscript{527} As stated in the Sustainable Development Strategy, ODA has subdivided
the five themes into 12 sustainability aspects of carbon; water; waste; materials; biodiversity
and ecology; land, air, water and noise; supporting communities; transport and mobility;
access; employment and skills; health and well-being; and inclusion. Objectives for these
sustainability aspects are summarised in Table 3 below.


\textsuperscript{527} Olympic Delivery Authority, above n 202, 9.
TABLE 3 – Objectives for ODA’s sustainability aspects

<table>
<thead>
<tr>
<th>ASPECT</th>
<th>OBJECTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>Minimise carbon emissions.</td>
</tr>
<tr>
<td>Water</td>
<td>Optimise the opportunities for efficient water use, re-use and recycling.</td>
</tr>
<tr>
<td>Waste</td>
<td>Reuse, recycling and reduce waste; and identify, source, and use environmentally and socially responsible materials.</td>
</tr>
<tr>
<td>Materials</td>
<td>Identify, source, and use environmentally and socially responsible materials.</td>
</tr>
<tr>
<td>Biodiversity and Ecology</td>
<td>Protect and enhance biodiversity and ecology.</td>
</tr>
<tr>
<td>Land, Air, Water and Noise</td>
<td>Optimise positive and minimise adverse impacts on land, water, noise, and air quality.</td>
</tr>
<tr>
<td>Supporting Communities</td>
<td>Create new, safe mixed-use public space, housing and facilities appropriate to the demographics and character of the local area; and adaptable to future climates.</td>
</tr>
<tr>
<td>Transport and Mobility</td>
<td>Prioritise walking, cycling and the use of public transport.</td>
</tr>
<tr>
<td>Access</td>
<td>Create a highly-accessible Olympic Park and venues through inclusive design.</td>
</tr>
<tr>
<td>Employment and Skills</td>
<td>Create new employment and business opportunities locally, regionally and nationally.</td>
</tr>
<tr>
<td>Health and Well-Being</td>
<td>Provide for healthy lifestyle opportunities.</td>
</tr>
<tr>
<td>Inclusion</td>
<td>Involve, communicate, and consult effectively with stakeholders and diverse communities.</td>
</tr>
</tbody>
</table>

The Sustainable Development Strategy also broadly outlines how these sustainability objectives will be met. For example minimising carbon by ‘efficient energy supply through low carbon technologies’ and in relation to waste, ‘seeking to design out, as far as practical, the production of waste during construction and operation of the facilities’. It also includes some targets for each sustainability aspect, including for waste, at least 90 per

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528 Adapted from ibid 10.
529 Olympic Delivery Authority, above n 202, 14.
530 Ibid 19.
Part IV Section B

cent of the material from demolition works to be reused or recycled.\textsuperscript{531} As the targets specified in the Sustainable Development Strategy are for all Games activities, they are not all listed here. However, the targets adopted by ODAT for its specific activities and focused themes are provided below. ODA and by default ODAT fully engaged early on with stakeholders in the development of its sustainability objectives and targets, including with industry associations.\textsuperscript{532} This is further discussed below in the section on procurement processes.

The Sustainable Transport Strategy is also of relevance to the sustainability objectives and targets, and is linked to the Sustainable Development Strategy and the London 2012 Sustainability Plan. It focuses ODAT’s efforts on three of the five headline themes identified in the London 2012 Sustainability Policy: healthy living, inclusion and climate change. These key sustainability themes are viewed as the most significant and relevant to transportation activities, although ODAT still undertakes initiatives in relation to the other two themes of biodiversity and waste.\textsuperscript{533}

ODAT adopts targets from ODA for the various themes, including its three key themes, but needs to meet the targets through specific activities and initiatives suited to the context of its transport projects.\textsuperscript{534} Interviewee OE1 explained how ODAT receives the ‘aspirational targets’ from the ODA corporate sustainability framework, such as re-using or recycling at least 90 per cent of demolition waste, and then translates those targets into the reality of delivering its transport projects. These targets – and specific initiatives under each target – as relevant to delivering urban rail projects and in particular Orient Way and West Ham, are discussed in further detail below.

(a) Healthy Living

Healthy living targets for ODAT include planning for 100 per cent of spectators to travel to all venues by public transport, walking and cycling – a target provided by the London 2012 Sustainability Plan. Other targets include to upgrade or create 80 kilometres of walking and

\textsuperscript{531} Ibid.
\textsuperscript{532} Interviewee OS2.
\textsuperscript{533} Interviewee OS1.
\textsuperscript{534} Interviewee OE1.
cycling routes around venues in London, and upgrade or create 20 kilometres of walking and cycling routes around venues outside London.\textsuperscript{535} ODAT is working with TfL to meet these walking and cycling route targets. In September 2010, 12 additional walking and cycling schemes had been completed.\textsuperscript{536} An Active Travel Plan has also been developed in partnership with TfL and LOCOG. The aim of the Active Travel Plan is to promote and encourage spectators and the workforce to use active forms of travel to get to and from venues.\textsuperscript{537}

This theme and its targets therefore generally relate to the type of urban rail infrastructure project being delivered, for example bike and pedestrian paths, or a project’s ‘inherent sustainability’, as opposed to the delivery phase of that infrastructure. Hence, this theme is not examined in the context of the two project examples – Orient Way and West Ham.

(b) Inclusion

The London 2012 Sustainability Plan requires that there is a Games Mobility Service at all venues, which will provide assistance at spectator entry points, in public areas and in venues.\textsuperscript{538} ODAT also developed an Accessible Transport Strategy for passengers with restricted mobility, such as disabled people, older people and parents with infants. Targets include catering for approximately 15-20 per cent of spectators who are expected to have specific access needs.\textsuperscript{539}

This theme does relate to the delivery phase of ODAT’s transport projects. West Ham is a better example than Orient Way because of the nature of the Orient Way project which was not concerned with moving people to, from, and around the Games. Specific initiatives to fulfil commitments in the Accessible Transport Strategy on the West Ham project include the provision of lifts, and audible and visual information facilities.

\textsuperscript{536} Olympic Delivery Authority, ‘Quarterly Transport Sustainability Report’ (Report, Olympic Delivery Authority, September 2010) emailed to author 16 November 2010, 3.
\textsuperscript{537} Commission for a Sustainable London 2012, above n 535, 8.
\textsuperscript{538} Ibid 6.
\textsuperscript{539} Ibid 7.
Stakeholder consultation has been crucial in developing the Accessible Transport Strategy. Tailored stakeholder engagement methods, such as an Access and Inclusion Forum, allowed the views and opinions of local disabled people to be instrumental in the development of the Accessible Transport Strategy and related targets.\(^{540}\) ODAT has also committed to improving transport links from lower socio-economic areas of London to the Games sites.\(^{541}\)

(c) Climate Change

ODAT aims to comply with ODA’s target for a 50 per cent reduction of the Olympic Park carbon emissions by 2013 against a ‘base case’ or reference footprint.\(^ {542}\) Another relevant ODA target is for 20 per cent of energy to be provided by renewable energy infrastructure on the site.\(^ {543}\) ODAT has undertaken specific initiatives relating to climate change including developing low carbon criteria in the procurement framework for procuring goods and services for transport operations.\(^ {544}\) Low carbon vehicles are being procured and the feasibility of electric or emission free vehicles is being investigated, so that the environmental impact of ODAT venue operations is minimised.\(^ {545}\) ODAT is also trying to determine carbon emissions associated with how spectators travel to and from the Games, much in the same way a holistic carbon assessment of materials would include transport to the site.\(^ {546}\)

The climate change theme was particularly relevant in the delivery of Orient Way because positive environmental outcomes were a key project driver.\(^ {547}\) Orient Way achieved a 23 per cent reduction in carbon against its base case and an ‘excellent’ CEEQUAL award.\(^ {548}\) Specific initiatives included a wind turbine on site to power the new train accommodation block for train drivers. Further, many of the recyclable elements of the track were reused to build the block. Such initiatives contributed to the excellent (87.2 per cent) CEEQUAL

\(^{540}\) Whittaker et al, above n 206, 33; interviewee OS1.
\(^{541}\) Interviewee OS1.
\(^{542}\) Olympic Delivery Authority, above n 202, 14; See Section 10 below.
\(^{543}\) Olympic Delivery Authority, above n 202, 15.
\(^{544}\) Olympic Delivery Authority, above n 536, 3.
\(^{545}\) Ibid.
\(^{546}\) Interviewee OD1.
\(^{547}\) See above Section A.
\(^{548}\) For an overview of the CEEQUAL Scheme see Section 6 below.
Carbon reduction was monitored through the Carbon Footprint Study undertaken by Best Foot Forward and the principal contractor. On West Ham, specific initiatives relating to addressing climate change included the adoption of technology known as spectator-powered lighting to supplement existing lighting energy supply. The Commission for a Sustainable London refer to this technology as ‘football technology’, likely because it is already used at some football stadiums. The ODA competitively tendered, via its supplier engagement website (see below), for the opportunity to install spectator-powered lighting trials. Such technology converts kinetic energy created by the flow of spectators across ‘football harvesters’ into electricity, and it is estimated that it could power 15 per cent of the lighting load at West Ham station.

In the case of ODAT, the climate change theme seemed to be less concerned with potential climate change impacts on transport infrastructure than would have been expected. For both Orient Way and West Ham, the focus was on climate change mitigation, as in reducing carbon emissions, as opposed to climate change adaptation. The reason for this is not clearly understood. Certainly, the United Kingdom (UK) has been active in climate change adaptation research and planning. Further, some key stakeholders to the Games have specific climate change adaptation programs in place, including the Greater London Authority through the London Climate Change Partnership. Also, TfL is currently implementing a program to address potential climate change impacts which includes flood management plans and a tunnel cooling program.

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550 Best Foot Forward is a UK-based sustainability consultancy. See <www.bestfootforward.com/>.
551 Interviewee OE1; For more information on measuring and monitoring, see Section 10 below.
552 Commission for a Sustainable London, above n 535, 12; Whittaker et al, above n 206, 32.
553 Commission for a Sustainable London, ibid.
555 Commission for a Sustainable London, above n 535, 12; Olympic Delivery Authority, ibid.
556 See for example work being done at the Tyndall Centre for Climate Change Research at <www.tyndall.ac.uk/> and the Centre for Climate Change, Economics and Policy at <www.ccccep.ac.uk/Home.aspx>.
557 For information on the Partnership, see <www.london.gov.uk/lccp/> at 12 March 2011.
(d) Other Themes and Aspects

Many of the other London 2012 and ODA sustainability themes and aspects, and the associated objectives, targets and initiatives, are still relevant to ODAT, albeit that they may not be transport project-specific.

For example, as stated above, ODA has a target of at least 90 per cent, by weight, of material from demolition works to be reused or recycled.\(^{559}\) On Orient Way, 99 per cent of the demolition and site clearance waste was recycled including: 4,000 tonnes of crushed concrete, of which 1,000 tonnes was re-used on site; 620 tonnes of tarmac; 180 tonnes of steel; and 20,000 tonnes of previous site ballast was screened and re-used. Further, all 3,250 yards of track were lifted and re-used.\(^{560}\) Progress toward this reuse and recycle target was monitored mainly through waste transfer notes.\(^{561}\)

On West Ham, where possible, surplus materials from the Olympic Park are being included within the specification for the works to allow Games-wide re-use and to minimise travel distances.\(^{562}\) Levelling of lands and gabion filling, as well as pavement edging in cobbles, have been identified for re-use. The temporary walkway structures at West Ham will be dismantled after the Games with many hired items being returned to the suppliers for re-use (see Section 4 below). Remaining materials will be, where possible, reused in their existing form or recycled.\(^{563}\)

With respect to employment and skills, all ODA contractors have to sign up to CompeteFor. CompeteFor is a free service that enables businesses to compete for contract opportunities linked to the Games and other major public and private sector buying organisations, such as TfL. It also facilitates access to focused business support, through the national Business Link network, helping to boost the competitiveness of local businesses.\(^{564}\) As an example, ODAT advertised the request for proposal (RFP) for investigating spectator-powered lighting on the

\(^{559}\) Olympic Delivery Authority, above n 202, 19.

\(^{560}\) CEEQUAL, above n 38.

\(^{561}\) And indeed any deviation from this target would have been obvious as an order would have had to be placed for the removal of waste. Interviewee OE1.

\(^{562}\) Olympic Delivery Authority, above n 201, 6.

\(^{563}\) Ibid.

Part IV Section B

CompeteFor website.\textsuperscript{565} This indicates a commitment to providing opportunities for both applying innovative technology and for small companies.\textsuperscript{566}

4 Design Processes and Infrastructure Sustainability

(a) Background

As discussed in Part III Section B(4), design processes are crucial for embedding sustainability objectives, targets and initiatives, and for realising sustainability outcomes. Sustainability needs to be integrated as part of all design stages so that sustainability initiatives are effectively ‘locked in’ as part of the project,\textsuperscript{567} because constructing contractors and sub-contractors are required to build what is in the project’s specifications. Of significance therefore is having a strong interface between design processes and the approach to governing infrastructure sustainability.

(b) Interface with Sustainability Objectives, Targets and Initiatives

As outlined in Part II Section C(3), the design of the Orient Way and West Ham projects was contracted out. For Orient Way, the consultancy ARUP was engaged to develop the reference design which informed the design brief for the detailed design stage, and subsequent construction. Similar contractual arrangements were in place for West Ham. The sustainability requirements expected of the contracting design team are discussed in the section below on procurement, namely in the context of the design of West Ham station. However, ODAT interviewees, and in particular those from the design discipline, provided insight into the nexus between design processes and ODAT’s sustainability objectives, targets and initiatives, mainly using West Ham as an example.

Interviewee OD1 discussed how there were some complex design issues on the West Ham project, including relating to existing structures, such as a gas main that was in the way of the only optimal staircase location. Because of these complexities, ODAT worked closely with the design contractor Atkins. According to interviewee OD1, ODAT was ‘quite an invasive

\textsuperscript{565} Interviewee OS1.
\textsuperscript{566} Commission for a Sustainable London, above n 535, 12.
\textsuperscript{567} See Part III Section B(4).
client team in terms of the design ... just blurring the lines a little bit in the aim of getting the job done’.

According to interviewee OD1, because of such design constraints and challenges, the design solution that was produced for the West Ham project was not really driven by sustainability considerations, but rather completing the works on time and on budget. Fortunately, the solution by default had a low carbon footprint. Interviewee OD1 stated that ‘we were mindful of sustainability but it wasn't the number one driver; the engineering constraints on this one definitely won out’. He added that:

In the process of design there is no right or wrong answer, it’s the best compromise that you come to between achievability and what you can get away with – with the neighbours, against what your carbon footprint might be, against what the cost might be ... So it’s this whole sort of compromise and there is a low point somewhere amongst all the requirements, which is where you hope to sit ... It’s quite an interesting balance and I think [for West Ham] we've settled on something that is quite respectable.

Interviewee OD1 raises an interesting point. Functionality and the need to ‘get the job done’ will nearly always be key decision-making factors in design processes, and quite logically so. There may be some projects therefore where decisions based on sustainability considerations are hindered because of other critical issues relating to the project program. In terms of who is making those decisions and considering all the different requirements and factors, interviewee OD1 observed that ‘it is a very subtle thing and I think it really does come down to the eye of the designer making the decisions’.

So although ODAT has a strong sustainability mantra and a well articulated approach to governing infrastructure sustainability – as is discussed throughout this Part – the decision-making power of key design personnel to adopt, reject or alter sustainability objectives, targets and initiatives based on other design considerations should not be underestimated. The need to capacity build designers on sustainability, and provide them with appropriate decision-support tools, is therefore critical and is discussed in greater detail in Section 8 below. But as discussed further in that section, it is critical to provide the design team with the necessary knowledge and skills to both meaningfully consider sustainability criteria in the

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568 Interviewee OD1.
decision-making process, and to understand how best to optimise sustainable design. Also of
importance is setting up systems of checking and corrective action (see Section 11 below)
that make designers accountable for veering away from sustainability commitments.

Interviewee OD1 discussed the importance of pushing the boundaries during the design
process to achieve ODAT’s sustainability objectives and targets, and also the power that
designers have to influence the supply chain. For example, West Ham has acoustic hoarding
along the side of the station, made up of an aluminium frame and polycarbonate panels,
neither of which are good in terms of environmental and carbon performance. ODAT
contacted the manufacturer of the aluminium and asked about options for recycling and
reusing. The manufacturer agreed to have the materials returned for re-use after two years
with a 40 per cent cash back. According to interviewee OD1, the manufacturer responded that
it was something that other customers had never asked about. This demonstrates that there is
value in simply asking the question ‘what is possible?’.

This initiative is particularly good environmentally because, according to interviewee OD1,
the aluminium can be re-used in its same form without being reworked. It was only possible
because the West Ham project works are temporary. However, actively seeking options for
material re-use with suppliers can still be relevant to projects with longer life-spans, albeit
that it may not be the same manufacturer who buys back the materials. Such requirements
should therefore be written into a decommissioning or demolition plan. However, an in depth
discussion of post-construction project stages and sustainability is beyond the scope of this
thesis.

ODAT has likely enhanced the manufacturer’s understanding of what is possible through this
process. This manufacturer may then offer a similar service to other clients. As interviewee
OD1 explained, ‘the hope is that the manufacturer then offers that in legacy to anyone else
that then asks’. In this way, ODAT has likely enabled legacy outcomes, discussed further in
Section 13 below.

569 Information on the environmental performance – including in relation to GHG emissions – of these and other
5 Planning Approval Processes and Infrastructure Sustainability

(a) Background

The key planning authorities relevant to the Games activities are the Greater London Authority, in addition to each of the host boroughs, namely Newham, Waltham Forest, Hackney, Greenwich and Tower Hamlets. The relevant planning tools include the Town And Country Planning Act 1990, the Town And Country Planning (General Development Procedure) Order 1995, and the Town And Country Planning (Environmental Impact Assessment) (England And Wales) Regulations 1999. As part of the typical planning approval process, the findings of various environmental (including ecology and local community impact) studies commissioned by ODA are subsequently translated into planning conditions of consent by the relevant local authority.\(^{570}\)

In some instances, the ODA Planning Decisions Team receives applications within the Olympic Park area instead of the four Boroughs. The Planning Decisions Team follows the same statutory processes as other London Boroughs when processing applications in relation to the Games.\(^{571}\) The Planning Decisions Team assesses each application and makes a recommendation to the ODA Planning Committee, which then makes the final decision. For example, this process was undertaken for the Olympic, Paralympic and Legacy Transformation Planning Applications at the early stages of planning for the Games.\(^{572}\) These applications set a framework for how the sites would be developed.\(^{573}\)

(b) Interface with Sustainability Objectives, Targets and Initiatives

This Section discusses the interface between the planning approval process and infrastructure sustainability in the context of ODA. This is because data on this interface (namely from the interviews and project-related documents) was only retrievable for ODA, not ODAT. It is deemed appropriate to include discussion on this interface despite that it is not in the specific context of ODAT. This is because there is ample discussion on this interface in the SMA case

\(^{570}\) Interviewee OS1.
\(^{572}\) Ibid.
\(^{573}\) Ibid.
study Part III Section B(5) and therefore some discussion is needed to facilitate the comparative study found in Part V. It is also important because it shows how this interface worked in practice. SMA was only part way there. It had sustainability objectives, targets and initiatives written into SoCs, but did not receive any conditions of consent prior to the Sydney Metro project being deferred.

According to interviewee OS3, ODA’s sustainability team, discussed further in Section 9 below, uses a lot of the conditions of consent as the ‘stick to get the design and construction teams to buy into the sustainability targets’. Indicators to track progress toward the different sustainability targets are intentionally devised with some sort of legal basis to the maximum extent possible to give ‘backbone’ to ODA’s sustainability program, and conditions of consent are a major part of this. ODA’s sustainability team therefore make sure that they understand all of the mandatory conditions of the planning consents, and communicate often with the planning team to be updated with any consent modifications.

Prior to implementation of an indicator, the sustainability team will check back with the planning team to make sure the interpretation of the condition is correct, and that the performance information used for that indicator will link directly to demonstrating compliance. Further, for any cases where it appears ODA and its delivery partners will not be able to meet the condition of consent based on monthly performance against an indicator (see Section 11 below), they go back to the planning team to discuss appropriate actions, such as a consent modification.

The sustainability advisers do not appear to influence how the planning conditions are articulated in terms of sustainability objectives, targets and initiatives, but rather work with the final planning conditions. Further, interviewee OS3 suggested that the planning authorities did not consider ODA’s sustainability commitments in developing the planning conditions, although the accuracy of this could not be confirmed.

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574 Interviewee OS3.
575 Ibid.
6  Procurement Processes and Infrastructure Sustainability

(a) Background

As discussed in Part III Section B(6), the nexus between infrastructure sustainability and procurement processes is critical. For desired sustainability outcomes to be realised, they need to be appropriately and meaningfully translated into procurement and contract documentation as sustainability requirements.\textsuperscript{576} Also of importance for sustainability outcomes is the proposal evaluation framework or process in place, as well as the delivery method in terms of the type of contract.\textsuperscript{577}

(b) Interface with Sustainability Objectives, Targets and Initiatives

(i) A Commitment to Sustainability in Procurement

From the onset, ODA has been committed to integrating sustainability into procurement processes, including specific contracts, across the entire Games program.\textsuperscript{578} ODA realised early on that it needed to be ‘a smart client who knows what to ask of industry and contractors’.\textsuperscript{579} Sustainability is addressed within a dedicated section in ODA’s overall Procurement Policy. The Policy aims to advance infrastructure sustainability and sustainability outcomes through seeking continuous improvement on its own, and its contractors’, performance.\textsuperscript{580} Specific sustainability targets laid out in the Sustainable Development Strategy are included in the Procurement Policy, such as the target for 90 per cent of demolition material to be re-used or recycled.\textsuperscript{581} This gives significant impetus to ODA’s sustainability agenda because it conveys ‘a strong, clear message to suppliers and contractors about what the organisation seeks and expects from them’.\textsuperscript{582} In turn, the Sustainable Development Strategy refers to the Procurement Policy in terms of ‘commitment to sustainability being a core component’ of procurement.\textsuperscript{583} The London 2012 Sustainability Plan then identifies procurement as an area that requires action across the five sustainability

\textsuperscript{576} See Part III Section B(6).
\textsuperscript{577} Ibid.
\textsuperscript{578} Whittaker et al, above n 206, 18-19.
\textsuperscript{579} Interviewee OS2.
\textsuperscript{580} Olympic Delivery Authority Transport, above n 523, 14.
\textsuperscript{581} Olympic Delivery Authority, above n 208, 7.
\textsuperscript{582} CIPS Knowledge Works, above n 208, 4.
\textsuperscript{583} Olympic Delivery Authority, above n 202, 11.
themes discussed above. These linkages between the different strategic documents strengthen ODA’s approach to procurement and infrastructure sustainability.

In keeping with these corporate commitments, compelling contractors to address infrastructure sustainability and achieve sustainability outcomes through procurement processes is viewed by ODAT as ‘critically important’. This importance was made clear by interviewee OL2, who stated that ‘it is unlikely sustainability initiatives will materialise unless specified in contracts because industry relies heavily on its contract mechanisms’. ODAT has adopted the Procurement Policy and ODA’s overall approach to procurement and infrastructure sustainability. Specifically, ODAT has made efforts to translate its sustainability objectives and targets, as well as manage infrastructure sustainability, via its procurement processes, including through sustainability requirements in RFP documentation.

ODA ensures that, where possible, it is non-prescriptive in its sustainability requirements so as to encourage innovation. According to interviewee OS2, ‘the inclusion of sustainability targets in procurement documentation, and the assessment of tenders against a balanced scorecard drove companies to improve the sustainability of their products and processes ... this quite often resulted in innovation’. ODAT has also adopted such a non-prescriptive approach. Specific examples of ODAT’s sustainability requirements are provided below.

(ii) Developing the Targets – Engagement

ODA spent a considerable amount of time investigating the feasibility of the targets it was setting and would be requiring of its contractors. According to interviewee OS2, ODA ‘spent a lot of time doing background research to develop its sustainability targets and consulted with industry on these to ensure they were pushing best practice, but were also deliverable.’

Further, ODA sustainability advisers discussed the targets with the ODA Director of Construction Delivery, seeking his knowledge on the feasibility of the targets they were proposing, which also assisted in getting this Director ‘on board’. This task of investigating

585 Interviewee OL2.
586 Interviewee OS1.
587 Interviewee OS2.
the targets was assisted through adequate sustainability resources including a team of approximately 17 sustainability advisers, who had expertise in different areas of infrastructure sustainability, or knew where to find the right information. Interviewee OS3 explained that ‘it is important to talk to absolutely everyone you can on your targets to make sure they are viable, and to understand all of the different dimensions’.

ODAT appears to have followed this approach: however it was not only the sustainability advisers who investigated the feasibility of certain targets and initiatives. Interviewee OD1 discussed the work he has done on West Ham investigating different material and design options in order to minimise the project’s carbon footprint. Further, many of the targets set by ODA were adopted by ODAT and subsequently the research into the feasibility of the targets was also applicable to ODAT projects. This included, for example, research into concrete products with lower embodied energy and therefore reduced contribution to carbon emissions. However, some ODA targets were not adoptable on ODAT’s urban rail projects due in part to restrictive rail standards. As interviewee OS1 observed:

A number [of targets] were not applicable but all were aligned where they did apply, for example targets for waste, recycling and low carbon concrete. One example where a target wasn’t applicable would be in the use of timber. The fire risk implications precluded the use of timber on London Underground stations and meant we had to use steel, a higher carbon material, but this was unavoidable.

Challenges associated with rail standardisation are discussed further in Section 8 below.

ODA, and by default ODAT due to the adoption of many of the corporate sustainability targets, also engaged in early consultation with industry and the supplier market on infrastructure sustainability. ODA hosted forums informing and getting feedback from industry on its key sustainability objectives and targets, which sent clear early signals to the marketplace on its sustainability requirements. An example of this can be seen in the

588 See Section 9 below.
589 See Section 4 above.
590 Interviewee OS2.
591 Olympic Delivery Authority Transport, above n 523, 14.
Strategic Forum for Construction established on behalf of the construction industry in relation to the Games. The aim of the Forum is to encourage industry to ensure a best practice approach to every aspect of the Games.\textsuperscript{593} Delivering on sustainability commitments is a key issue discussed in this Forum.\textsuperscript{594} Both ODA and ODAT sought the skill and experience that existed within the market to understand what initiatives were possible to achieve the sustainability targets – hence it was a ‘two-way street’ of communication and engagement. This is demonstrated in investigations into innovative technology to reduce the carbon footprint of some of its projects.\textsuperscript{595}

Further, ODA did a lot of work with an organisation called Constructing Excellence. According to interviewee OS3, at that time it was the only organisation using indicators to monitor different construction activities across the UK. They already had numerous entities within the construction industry using these indicators to track environmental performance. ODA went to this organisation because it wanted to know what activities were easy or difficult to track, and what constituted good or poor performance.\textsuperscript{596} However, these indicators did not on the whole include social performance. Therefore, ODA fed back to Constructing Excellence on how to develop a holistic set of sustainability indicators. Further, Constructing Excellence had a performance scale of one to ten. According to interviewee OS3, ODA ‘drilled it down to actual quantitative points, not just ‘we think we are about an 8’’. According to the independent review organisation, the Commission for a Sustainable London 2012, such engagement with industry has ‘led to sections of the industry being ready to respond to the requirements’.\textsuperscript{597}

ODAT also undertook specific engagements on its sustainability objectives and targets. For example, it engaged with transport-related stakeholders,\textsuperscript{598} including Network Rail and TfL, because such organisations are responsible for asset managing the facilities delivered, or in some way altered, by ODAT in undertaking its project program. Therefore, any sustainability initiatives had to be palatable and viable in terms of operations, and required their ‘buy-in’.

\textsuperscript{593} Olympic Delivery Authority Transport, above n 523, 15.
\textsuperscript{594} Ibid.
\textsuperscript{595} See Section 3 above.
\textsuperscript{596} Interviewee OS3.
\textsuperscript{597} Commission for a Sustainable London 2012, above n 592, 5.
\textsuperscript{598} Interviewee OS1.
Further, as discussed above, ODAT was actively involved in discussions with industry on its sustainability objectives and targets. In addition, ODAT shares information on its overall approach to governing infrastructure sustainability. ODAT’s Sustainability Manager was a member of the UK construction industry research and information association, CIRIA’s, Sustainability Club. This commitment to knowledge sharing is discussed further in Section 12 below.

(iii) Exact Sustainability Requirements

The author was unable to view RFP documentation relating to Orient Way. Only relevant RFP documentation for the West Ham project was viewed, as well as standard text to be inserted by ODAT when developing project-specific RFP documentation, including in relation to infrastructure sustainability. Further, interviewees provided much information about the form and content of the sustainability requirements, which could generally be verified by reviewing other project-related documents including a Quarterly Transport Sustainability Report from 2010.

In terms of exact wording around sustainability requirements, the standard text template includes guidance notes for the procurement team to articulate requirements in the RFP documentation. It is separated into sections including health and safety risks, quality management and functionality, and sustainability. The sustainability section (J06) states that the procurement leaders must liaise with the sustainability advisory team to add in the specific environmental and sustainability items that relate to the project in question. This would include sustainability advisers in both ODAT and ODA. Indicative wording is then provided:

Tenderers must explain how they will contribute to achieving the London 2012 Sustainability aims and objectives with reference to the following – how does the tenderer’s organisation build sustainability into its operations from design through the construction? In its response, the tenderer must include a description of the way in which it procures goods and services with particular reference to diversity, fair employment and environmental attributes and how it intends to ensure those attributes support the London 2012 Sustainability Policy.

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599 Interviewee OS1. This ‘Club’ is akin to a working group or taskforce. It develops technical and strategic documents and undertakes other activities in relation to sustainability issues in the construction industry.

600 See Section 11 below.
The template then provides guidance for proposal evaluators, namely through a scoring system from ‘excellent confidence’ to ‘good confidence’, ‘concerns’ and ‘major concerns’. A key finding from reviewing this template is that ODAT’s procurement team is encouraged to rely on provisions in the London 2012 Sustainability Policy, which as discussed above includes sustainability objectives. They are also required to seek advice and input from the sustainability advisers. The tenderer is then left to demonstrate how it would achieve those objectives. Hence, this is a non-prescriptive approach that allows the ‘market’ to innovate.

The RFP documentation for West Ham included a technical questionnaire on environment and sustainability which tenderers responded to. Questions pertaining specifically to sustainability included: i) does the tenderer commit to ODAT’s strategy regarding environmental sustainability? ii) will the tenderer cascade this strategy through the supply chain? and iii) does the tenderer have a sustainable development policy? (and the tenderer is then required to upload the comprehensive policy). The questionnaire stated that all of these questions are mandatory, and the tenderer’s response may be rejected if it answers ‘no’ to any of them.

Because these are ‘closed’ or ‘yes or no’ type questions, it may appear that they would have limited value in informing decision-makers of a tenderer’s existing and intended sustainability performance. However, tenderers were also required to upload the sustainable development policy (if they had one) and accompanying supporting documents, which would have provided more information to inform decision-making. Further, Section A295 of the West Ham Project Information document provided at the RFP stage relates to sustainable development and it set out specific requirements for the West Ham project works. This Information document made up part of the final contract once the successful tenderer was engaged.

The first requirement in Section A295 is on carbon emissions. It states that ‘the contractor will undertake a carbon footprint study of the design stage to enable carbon reduction to be delivered during construction’ and that ‘particular attention should be given to reuse, recycle methods and use of raw materials’. It is suggested that this wording is not optimal. Instead of ‘use of raw materials’, it could be linked to an objective of ‘minimise use of raw materials’ to make it a stronger contractual condition. Further, it is unclear how undertaking a carbon
footprint study at the design stage will enable carbon reduction during delivery. Perhaps it should have read ‘the contractor must estimate carbon emissions associated with the construction of the works, and develop a carbon emissions reduction plan for both the design and construction phase. Such a plan is to include opportunities for re-use and recycling methods, and minimising the use of raw materials’.

Although the wording in this Section A295 could be improved, these conditions are again non-prescriptive. ODAT is not forcing the contractor to use a particular methodology or approach in terms of, for example, undertaking the carbon footprinting study. Further discussion on the requirements in Section A295 can be found in the following Sections iv and v.

(iv) Requiring CEEQUAL

Section A295 of the West Ham Project Information document also states that ‘the contractor shall register the project under the CEEQUAL regime and use best endeavours to achieve an excellent rating (whole project)’. The ‘whole project’ award is normally applied for jointly by or on behalf of the proponent, designer and principal contractor, and is therefore for the whole delivery phase. Other awards include the design award, applied for by the principal designer only; the construction award, applied for by the principal contractor; and the client and design award.601 The contractor for West Ham registered the project with CEEQUAL and is committed to achieving a high score for this project.602 According to interviewee OS1, West Ham is ‘on track’ for an excellent rating or score, however verification of this score will not take place until December 2011. CEEQUAL uses percentage scores so that pass >25 per cent, good > 40 per cent, very good > 60 per cent, and excellent > 75 per cent.603

CEEQUAL was introduced in Part I of this thesis. It aims to improve sustainability in infrastructure projects. The Scheme is based on a self-assessment carried out by a trained CEEQUAL assessor that is independently verified by CEEQUAL-appointed verifer. Although focused primarily on environmental issues such as energy and water, some social

602 Interviewee OS1.
603 CEEQUAL, ‘Scheme Description and Assessment Process Handbook’ (Guidelines, CEEQUAL, 2009) hard copy obtained from CEEQUAL in June 2010, 12.
issues such as nuisance to neighbours are also assessed. CEEQUAL is an established scheme, with over 80 awards having been made and 150 further projects currently been assessed in the UK since its launch in 2003.\textsuperscript{604} Late in 2010 the Scheme was adapted for use internationally (CEEQUAL International), but currently it is used primarily in the UK.

Both ODA and ODAT require its contractors to use CEEQUAL on all infrastructure projects associated with the Games. This appears to have been championed by ODAT in the first instance, and in particular the Head of Transport Systems and Games Safety,\textsuperscript{605} and then adopted by ODA. Although the contractor for West Ham was required to strive for an ‘excellent’ CEEQUAL rating or score, according to a number of interviewees, all contractors are required to achieve a minimum rating of ‘very good’.\textsuperscript{606} According to interviewee OS1, often the wording in RFP documentation and subsequent contracts reads ‘the contractor is expected to achieve > 60 per cent on the CEEQUAL assessment’.

Key benefits of having CEEQUAL embedded in procurement processes include that contractors are compelled to apply it, and it provides a means of standardising ODAT’s sustainability requirements.\textsuperscript{607} CEEQUAL is viewed as a good approach because when you require the use of it from a contractor, you get all of the requirements embedded in the tool.\textsuperscript{608} Also, because it is asked for in the RFP documentation, the tenderers can put the cost of applying CEEQUAL into their fees.\textsuperscript{609}

However, requiring the use of CEEQUAL by contractors is only a good approach if the Scheme itself is capable of encouraging and achieving the desired and meaningful infrastructure sustainability and sustainability outcomes. An analysis of the ability of CEEQUAL to achieve this, and further analysis of benefits and challenges associated with CEEQUAL, is provided in Section 9 below, and discussed further in Part V Section B(8).

However, in terms of the relationship between ODAT’s sustainability objectives and targets, and CEEQUAL’s assessment protocol, CEEQUAL does not specify actual targets, but rather

\textsuperscript{604} CEEQUAL, Full CEEQUAL Awards List <www.ceequal.com/all_awards.htm> 3 April 2011.
\textsuperscript{605} Interviewees OS1, OL3, OL2 and OE1.
\textsuperscript{606} Interviewees OS1, OE1 and OS2. An excellent score is > 75 per cent. A very good score is > 60 per cent and < 75 per cent. CEEQUAL, above n 601.
\textsuperscript{607} Interviewee OS1.
\textsuperscript{608} Interviewee OS1.
\textsuperscript{609} Interviewees OE1; Scanlon and Hodgson, above n 46, 50. See Section 10 below.
uses a set of questions. These questions prompt the user to provide evidence that a process, activity or initiative is in place to achieve a good outcome in a particular theme such as water or energy. Hence, it is not prescriptive, but rather is process-oriented – rewarding processes, activities and initiatives that are highly likely to achieve good outcomes. In this way, it is consistent with the approach of being non-prescriptive in what is asked of contractors in procurement processes.

Depending on the type of award being sought, part of or the whole CEEQUAL assessment may take place after the main procurement stage and during construction when outcomes are materialising. Therefore, in some cases evidence relating to actual outcomes may be appropriate to inform an assessment. But the key finding from the CEEQUAL approach is that a sustainability performance assessment tool should not specify actual targets to be met. This is because a target may constitute good performance for one type of project, but not another as infrastructure project-specifics vary significantly from sector to sector, and even within sectors. Each project will have different access to technology, be required to respond to different stakeholder expectations and may be presented with different opportunities, for example to improve local amenity or provide local employment.

(v) Direct Links to ODA’s Sustainability Objectives and Targets

In addition to the requirement for the West Ham contractor to achieve an ‘excellent’ CEEQUAL rating, the West Ham Project Information document sets clear requirements for contractors across most of the 12 sustainability aspects presented by ODA in its Sustainable Development Strategy. For biodiversity and ecology they include maximising, to the extent feasible, the opportunities to integrate construction practices with opportunities to enhance existing or created natural resources. For water they include ensuring that potable water consumption is kept to a minimum by minimising demand. For waste, ODA’s targets are specified, stating that the contractor will seek ‘to contribute to the ODA’s target that at least 90 per cent of material (by weight) arising during the demolition phase is reused or recycled’.

Similarly for materials, requirements include to identify and evaluate opportunities for the reuse of secondary materials within the construction process to meet and exceed ODA materials targets of using 20 per cent secondary materials, by value, in the permanent venues and associated infrastructure. In terms of employment and skills (although it is headed
‘apprenticeships’ in the documentation), the requirements include that ‘the contractor and his subcontractors of any tier work proactively to ensure that a minimum of 3 per cent of the workforce providing the works are apprentices’. And for the supporting communities aspect, requirements include that the contractor must design the works to be ‘sensitive to the character, diversity, and demographics of the surrounding Olympic Park and diversity of the local communities’. It is reasonable to assume that not all aspects were included because they were not all directly relevant to the scope of works.

The objectives for each aspect are also provided in the Information document. This is a clear indication that ODAT was indeed translating its sustainability objectives into its procurement processes. Again, it was not being prescriptive about how the contractor would achieve these sustainability objectives and targets, except in the case of requiring a carbon footprint assessment because this was a commitment made for all of ODA’s program of works. And although undertaking a carbon footprint assessment was prescribed, the optimal methodology to use was not.\(^{610}\)

The requirement to achieve a high CEEQUAL rating would help ODAT and the contractors achieve these sustainability objectives, however, as discussed above, the tool itself does not specify targets, but rather rewards good process. Therefore in both instances – in the requirements set by ODAT pertaining to the different sustainability aspects and because of the nature of the CEEQUAL tool – contractors have relative free rein to determine the process to achieve sustainability outcomes. This is not a prescriptive approach, but is instead a way of letting the ‘market’ innovate.

Also of relevance are the sustainability provisions in the Transport Services Framework. This Framework included a highly competitive tender process to preliminarily approve a list of suppliers,\(^ {611}\) which the project-specific RFP documentation would then be sent to. In the end there were 17 Transport Services Framework suppliers. This process included two stages where sustainability credentials were checked. Specific questions as part of this process

\(^{610}\) Probably due to uncertainty around carbon measurement and management as discussed in Section 10 below.

\(^{611}\) Email from interviewee OD1 (21 January 2011), which included attachments of West Ham RFP and contract documentation.
included whether the tenderer had a ‘Sustainable Development Policy and management system’, and if they did, they had to provide a copy.\textsuperscript{612}

For Orient Way, environmental objectives and outcomes were specified in the brief to the design consultant Atkins, including that an energy efficient train accommodation block was required.\textsuperscript{613} These environmental objectives were communicated by the Director of Transport to the Rail Projects Director. According to interviewee OL3, the rail project delivery arm received a:

Brief on Orient Way from [the Director of Transport] regarding what needed to be fixed, the timeframe and that it needed to be as environmentally sustainable as possible in keeping with ODA’s policy. ODA was still in its infancy at this stage. ODA obviously had the chequebook. So [there were] three important issues – on time, budget and environmental credentials.

In terms of local employment, ODAT’s approach to procurement has been crucial and includes the Supplier Guide and CompeteFor website, which is discussed above and which is targeted at 20 per cent of the contracts in the London 2012 supply chain. As an example, invitations to tender for the spectator-powered lighting initiative were advertised on the CompeteFor website, and two companies proposing two different technologies were shortlisted, both of which could be showcased at West Ham.\textsuperscript{614} Further, the requirements found in the West Ham Project Information document pertaining to local employment and skills also gives evidence of ODAT’s commitment to this aspect in procurement processes.

(vi) The Code of Construction Practice

Also of relevance to sustainability requirements at the tender stage is the Code of Construction Practice. Published in late 2007, the Code of Construction Practice sets out the management measures which ODA requires its contractors to adopt and implement for any construction on the Olympic Park site and related off-site activities, including for transport.\textsuperscript{615} It contains similar environmental categories to that of CEEQUAL, such as noise and vibration, ecology, air quality, and waste management and recycling.

\textsuperscript{612} Ibid.
\textsuperscript{613} Interviewee OE2.
\textsuperscript{614} Interviewee OS1.
Examples of objectives and general provisions in the Code of Construction Practice include, for waste management and recycling, that excavated material and waste will be re-used and/or recycled in environmentally beneficial uses within the Olympic Park development; and for ecology, that the contractor will be required to fence off areas to be retained and adjacent habitat areas to prevent incursion into or damage.\footnote{Ibid 46 and 56.} According to interviewee OD1, the Code of Construction Practice has been developed based on UK current best understanding of how to deliver a low environmental impact project. He added that ‘we'd like to think that that document does actually encompass everything that is good about construction at the moment’.

The Code of Construction Practice states that contractors will ‘be required to demonstrate compliance with sustainability objectives, as set out in the ODA’s Sustainable Development Strategy [and] contractors will be required to report progress against agreed sustainability indicators’.\footnote{Ibid 10.} It further states that this process will be supported by the use of CEEQUAL.\footnote{Ibid.} The Code of Construction Practice is therefore an important construction environmental management tool, and ties into the overall approach to governing infrastructure sustainability.

(vii) Proposal Evaluation and Implementation of Sustainability Requirements

From an organisational perspective, procurement processes and even the selection of contractors is largely the responsibility of the Head of Transport Systems and Games Safety,\footnote{Interviewee OL3.} in conjunction with the procurement team. ODAT’s Sustainability Manager has also been intimately involved in this process.\footnote{See Section 9 below.}

Tenderers’ responses to sustainability requirements, and previous sustainability performance and policies, are part of ODAT’s overall proposal evaluation process. As discussed above, in terms of getting on the Transport Services Framework, the tenderers were asked whether they had a ‘Sustainable Development Policy and management system’ and to provide a copy if they did.\footnote{See above n 611.} Then the standard text template provides guidance for proposal evaluators,
namely a score from ‘excellent confidence’ to ‘good confidence’, ‘concerns’ and ‘major concerns’. Of critical importance for the technical questionnaire for West Ham was that if the tenderer answered ‘no’ to any of the sustainability items, their proposal may have been rejected. Whilst this all looks good ‘on paper’, the extent to which these provisions actually do influence decision-making in terms of proposal evaluation is still unclear.

However, some interviewees provided insights into this matter. In the case of Orient Way, according to interviewees OL2 and OD2, environmental sustainability was only a small percentage of the proposal evaluation criteria. However, this is likely attributable to the fact the Orient Way was the first project to be delivered as part of the Games so much of the approach to governing infrastructure sustainability was not well defined or translated into procurement processes.

Inclusion of sustainability considerations in the proposal evaluation process is also covered by CEEQUAL. CEEQUAL includes questions on the proposal evaluation process, including on whether past environmental performance was considered. For example, question 1.3.2 asks ‘did the selection procedure for a) the principal designer, b) the main contractor, and c) the key [original emphasis] sub-contractor(s) consider their past environmental performance?’.

In terms of the level of sophistication of tenderer responses to the sustainability requirements, according to interviewee OS1, ‘industry is responding well to the requirements, such as CEEQUAL, but nothing has blown our minds in terms of responses and approaches’. This is in conflict with interviewee OS2’s remarks above about the ability of industry to provide ‘innovative solutions’. No doubt there were discrepancies based on individual experience in reviewing tender responses. Interviewee OS2 was likely speaking of experience with procurement processes for other types of infrastructure such as venues given that he is an employee of ODA.

There was also some discrepancy in opinion amongst interviewees in terms of the successful implementation of the sustainability requirements by contractors. The discrepancy occurred

622 See Part II Section C(1).
623 CEEQUAL, above n 38, 12.
624 See Part II Section A(4).
between ODA and ODAT interviewees, and even amongst ODAT interviewees. At the ODA level, interviewee OS2 observed that ‘contractors did innovate and rise to the challenge’ presented by the sustainability requirements. But again, as this interviewee came from ODA corporate, he was not necessarily referring to contractors associated with transport projects, but more likely to those involved in the delivery of the venues and other Games infrastructure.

On the other hand, on Orient Way, the contractors apparently had to be pushed into taking up CEEQUAL and other requirements, as discussed in Section 8 below. Yet interviewee OD1 discussed how the principal contractor that has worked on ODAT projects including Orient Way has been good at responding to sustainability requirements. The discrepancy within ODAT can be attributed in part to interviewee perception of contractor behaviour, as well as interviewee understanding of the sustainability requirements. Further, opinion would likely differ depending on the contractor in question. Some may have been better than others, and the level of implementation would be dependent on the particular sustainability requirement and project in question.

In terms of the discrepancy in opinions between ODA and ODAT, it can be observed that contractors working in the urban rail sector operate under different constraints to those in other sectors such as buildings. Such constraints present barriers to urban rail infrastructure sustainability on many levels, as discussed in the next Section. Ongoing measuring, monitoring and reporting is clearly important for the ongoing and effective implementation of sustainability requirements, and is discussed in Section 11 below.

7 Design and Procurement Processes – Challenges and Overcoming Them

(a) Overview

There were numerous challenges facing ODA and more specifically ODAT in relation to developing and implementing the approach to governing infrastructure sustainability. These challenges relate primarily to the interface between the sustainability objectives, targets and initiatives, and design and procurement processes. These challenges are discussed in this Section, including where applicable, how these challenges were overcome.
(b) Design-related Decision-making for Sustainability

Section 4 above alluded to some of the challenges in interfacing design processes with the sustainability objectives, targets and initiatives in the context of the West Ham project. They related primarily to the impact that design constraints, such as a tight project program, can have on making decisions based on sustainability considerations. It seems that ‘on the ground’ in project delivery, cost, time and engineering feasibility are still primary drivers, and this is perhaps reflected in the proposal evaluation process. Interviewee OD2 discussed this when talking about drivers for the West Ham project:

You don’t necessarily get the technically best outcome because the world does still seem, unfortunately, to be run by financial constraints, and I don’t think we are quite at the point where the carbon accounting [for example] can actually have as much weight as the financial. But it is getting there, it’s definitely up there as much as the review of the company's health and safety performance in the past.

There is no indication that such a challenge of making design-related decisions based on sustainability considerations was necessarily ‘overcome’ by ODAT. However, this finding suggests that, as discussed above, decision-support tools, as well as setting up checking and corrective actions and capacity building designers in sustainability, are all critical ingredients for promoting design-related decision-making based on sustainability considerations. Thus, securing the interface between design processes and the overall approach to governing infrastructure sustainability is imperative.

Other challenges associated with making design-related decisions based on sustainability considerations include a lack of understanding about the ‘true’ sustainability of an initiative. This phenomenon relates to a lack of understanding or knowledge about the actual environmental, social and economic impacts – whether direct or indirect – of an activity or initiative that has the aim of delivering a sustainability outcome. Demaid and Quintas explain that ‘industry has to accommodate to intended, unintended, rational and irrational effects when addressing sustainability issues’, adding that ‘the knowledge base is unstable’. They

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625 See Section 4 above.
626 Demaid and Quintas, above n 96, 608.
give a specific example of glass recycling and its energy intensity negating many perceived environmental benefits.  

Interviewee OD2 discussed this challenge of understanding the ‘true’ sustainability of an initiative in the context of the West Ham project. Specifically, he discussed how there was debate as to whether using timber handrails or steel handrails was more advantageous. He questioned whether environmental scientists in general actually have a firm enough understanding of the impacts of materials and further, the engineering properties of the materials. The West Ham project team in the end discovered that:

By volume a timber handrail may be more sustainable than a steel handrail ... but because it is less strong you need brackets [and] by the time you’ve factored in those supports, [and] if those brackets are steel, you get to a point where there is an awful lot more material needed to make a steel bracket than a straight steel pole [which would have made the handrail to being with].

Overcoming such a challenge requires the use of decision-support tools such as life-cycle assessment (LCA) and other methodologies that have the capability to examine both direct and indirect environmental, social and economic impacts. Where such tools are unavailable or ineffective with respect to the initiative in question, it may be necessary to adopt a precautionary approach whereby an initiative is rejected where there is insufficient information on its environmental, social and/or economic feasibility, benefits and disadvantages; as well as on its functionality and durability. Interviewee OD2 also suggested that there is a need ‘to better link the engineering concept with the sustainability concept’. He added that this is an area ODAT is grappling with. There is therefore a need to acknowledge limitations in understanding, as well as appreciate that, as interviewee OS3 expressed, ‘when you are blazing trails, it is hard to know what you are going to encounter along the way [and] there are bound to be some casualties’.

(c) The Construction Industry

Despite the general satisfaction with the response by contractors to the sustainability requirements, a number of interviewees identified challenges associated with the construction

\[^{627}\] Ibid 607-608.
\[^{628}\] See Part III Section B(10).
\[^{629}\] See Part III Section A(2) for definition of the precautionary principle.
industry in achieving the sustainability objectives, targets and initiatives. For example, according to interviewee OL2, the construction industry ‘is very immature in its understanding of sustainability and how sustainability fits in’. He used Orient Way as an example, remarking how ODAT had to push to contractors ‘left, right and centre to even move them forward [on sustainability]’. He added that ‘they didn’t even want to do CEEQUAL to start with, but we forced it upon them’. Further, in the context of ODA, Interviewee OS2 observed that there is a:

Need to change and challenge attitudes of the construction sector when it comes to sustainability. It is a relatively new field and contractors often have to be convinced of the merits of doing things in a more sustainable way. Attitudes of “why would we do this?” are a big barrier. Client demand for sustainability can change this.

Constraints associated with the construction industry adopting an infrastructure sustainability agenda have been discussed at length in the literature. Such constraints have been said to include inherent conservatism within the construction industry; the first or capital cost barrier in that a construction firm’s profitability is typically determined by fast construction schedules, not by the whole-of-life cost savings from the adoption of sustainability initiatives; and a lack of understanding and definition of sustainability so as to appropriately incorporate it into construction-related decision-making. Further, a study undertaken in 2005 of European construction companies’ attitudes toward sustainability found that while the larger construction companies are starting to address sustainability issues, smaller companies are lagging in effectively minimising impacts and maximising opportunities presented. More recently however, as outlined in Section 6 above, the UK

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construction industry has been active in gaining a better understanding of sustainability issues, including through work done by Constructing Excellence and CIRIA.\footnote{See for example CIRIA’s Strategy for Sustainable Construction project, information available at \url{<www.ciria.org/service/membership_options/AM/ContentManagerNet/ContentDisplay.aspx?Section=membership_options&ContentID=10849>} at 13 April 2011.}

Speaking about the West Ham project in particular, interviewee OD1 discussed how construction contractors were compelled to take sustainability seriously because of the nature of the Games. As discussed in Section A above, the Games pertain to the idea of a transformational program of works. And according to interviewee OD1:

\begin{quote}
I think it’s quite well known within the construction industry now that the Games are aiming to be the greenest ever. I think tactically playing, if you’re a contractor, then you adopt that mantra if you want to be successful. I think the trick is taking that and getting industry to do it all over the board rather than because it is [the Olympics].
\end{quote}

It is reasonable to assume that the construction contractors became more adept and willing to adopt infrastructure sustainability as the program of works for the Games matured. This can be assumed because interviewee OL2 spoke specifically about Orient Way, which as discussed was the first infrastructure project to be delivered as part of the Games. At this time, the construction industry – and especially those organisations operating in the UK urban rail sector which, as will be discussed, is particularly conservative – were probably not accustomed to the requirements they were being asked to meet, namely in relation to CEEQUAL. This is supported by an investigation undertaken by the author that revealed that by 2007, only two urban rail projects had undergone a CEEQUAL assessment, whereas by 2010, seven urban rail projects had done so.\footnote{The investigation was based on the awards section of CEEQUAL’s website. CEEQUAL, above n 38.}

Working on the ground with the construction contractors was viewed as valuable means of ensuring sustainability requirements were being met, as well as encouraging contractors to adopt infrastructure sustainability. According to interviewees OE1 and OD1, weekly progress meetings were held between ODAT, the designer consultants and the principal contractor for Orient Way to ensure environmental commitments, including those relating to the sustainability targets as discussed in Section 3 above, were being met. ‘Toolbox’ talks – where construction employees and relevant ODAT personnel would meet on-site to discuss
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key environmental, safety and other relevant issues – also took place on a weekly basis during the construction phase.\(^{636}\) This enabled ODAT to take an active role on-site and ensure environmental commitments were being met.

Challenges associated with the construction industry also appear to have been overcome through the consultative approach taken by ODA and ODAT in determining appropriate targets for the sustainability requirements with the construction industry.\(^{637}\) Further, interviewee OD2 interestingly asserted that the proponent has significant power to require contractors to achieve its sustainability objectives:

\[\text{It is very much led by the client. On Orient Way it was lead by ODAT, on West Ham similarly it was led by ODAT, because we believe in what we are doing. If the contractor doesn't think that way, he will be told to think that way, or made to feel that way.}\]

These different approaches demonstrate two distinct lines of thinking in how to get contractors to participate. The first is where contractors are consulted with and their capacity built. The second is where contractors are told what they must do, and will likely do it if they wish to be awarded the contract. It is reasonable to suggest that in fact both approaches are required, and the level of each will depend on the contractor, as well as the sustainability requirement, in question. Further discussion of, and recommendations for, developing and implementing sustainability requirements can be found in Part V Section B(6).

From the perspective of ODA, overcoming unwillingness of construction actors to adopt infrastructure sustainability was achieved in part through having tenacious and well-informed sustainability advisers, although such observations were not made by ODAT-specific interviewees. Interviewee OS2 provided a specific example pertaining to the use of a more sustainable concrete product. He discussed the role a particular individual played in changing industry thinking around concrete standards and getting key actors to adopt the sustainable alternative. He believed that this individual ‘saved more carbon than any other individual on the Games through her effort’. He added that:

\(^{636}\) Interviewee OE1.
\(^{637}\) See Section 6 above.
It took a huge amount of tenacity because you’re not just persuading the concrete suppliers, you’ve then got to persuade all of the architects, and the construction engineers. So you’re working with the whole industry ... setting up test panels to demonstrate to construction engineers and others the feasibility of such alternative products is an example of how you can overcome constraints.

The importance of sustainability advisor attributes, such as being ‘tenacious’, in the implementation of ODA’s approach to governing infrastructure sustainability is discussed further in Section 9 below.

(d) Standardisation and Risk Aversion of Urban Rail Sector

Other challenges discussed by ODAT interviewees included inflexible safety and other design standards pertaining to the urban rail sector, as well as a culture of risk aversion. When discussing potential infrastructure sustainability for some of ODAT’s urban rail projects, interviewee OD2 believed that:

The rail sector looks at whether things are going to cost time and money in maintenance. They need to be driven into the 21st century. They see solar panels as a risk – everything is a risk. They’re not forward thinking on [infrastructure] sustainability.

This interviewee also discussed the infeasibility of some of the ideas formulated by ODAT employees for infrastructure sustainability in the context of urban rail sector standards: ‘sometimes these crazy ideas come up and you just think no, this is not [feasible] ... on the railway we still have quite a lot of rigid standards that we cannot get away from [just] because the Olympic Delivery Authority wants something done’. Interviewee OE1 added that ‘there are a lot of standards in the railway that mandate you to do things a certain way and it can restrict what you do’. Such standards typically relate to safety which is a key issue for the urban rail sector in the UK and elsewhere.

Interviewee OL2 also gave insight into this issue of standardisation, speaking more broadly about the urban rail sector as opposed to purely about ODAT projects:

Another key barrier is the safety standardisation that has been built in to the whole infrastructure design and asset management regimes in the last 100 years. Because you’ve got asset engineers that have very prescriptive engineering standards, which again ranges from lighting, fire protection etcetera, that don’t allow you to use innovative technologies. So there are really clear barriers.
Also, ‘business as usual’ practice in the urban rail sector appears to favour the use of virgin materials over recycled, despite the fact that many railway materials can be recycled. According to interviewee OD2, ‘the ballast can be recycled, the rail can be recycled, it can be downgraded for freight for example, sleepers can be recycled ... although it is not an easy process’. But he questioned the cost benefit of using recycled materials because they may cost more to buy, for example because they need to be checked for integrity and transported potentially long distances. Then there is the added issue of some recycled materials not being fit for purpose for rail projects. 638

8 Roles and Responsibilities

(a) Background

As discussed in Part III Section B(9), roles and responsibilities relates to the organisational structure for sustainability including where sustainability advisers ‘sit’ in the project team, as well as their responsibilities in undertaking infrastructure sustainability. This Section examines ODAT’s organisational structure for sustainability. It also takes findings from an examination of the roles and responsibilities of ODA’s sustainability team to highlight the discussion where relevant – particularly in relation to the role of setting sustainability objectives, targets and initiatives as per Section 3 above, and in relation to the attributes of sustainability advisers.

(b) Organisational Structure for Sustainability

The SuMS clearly assigns responsibilities and roles for infrastructure sustainability and sustainability outcomes including at the leadership-level of ODAT. Overall accountability for ensuring that sustainability is embedded within ODAT and that key sustainability objectives, targets and initiatives are achieved rests with the Director of Transport. The Head of Transport Systems and Games Safety is responsible for reporting to the ODA Senior Management Team, and the London 2012 Heads of Functions and their Programme Managers, on the performance of the SuMS including recommendations for improvement. 639 ODAT’s Sustainability Manager is then accountable for the integration of the SuMS and

638 Interviewees OD1, OE1 and OD2.
639 Olympic Delivery Authority Transport, above n 523, 10.
ensuring that activities are carried out in accordance with the London 2012 Sustainability Policy. ODAT’s Sustainability Manager is required to inform the Head of Transport Systems and Games Safety on sustainability risks and opportunities, who in turn authorises key decisions. The Head of Transport Systems and Games Safety is responsible for the Sustainability Manager and other SSHEQ champions such as for safety. Figure 9 below outlines these relationships.

The role of ODAT’s Sustainability Manager was described further by interviewee OS1. He stated that the role comprised a ‘branching role between delivering the high level policy commitments of the Sustainable Development Strategy, and branching out to what is going on ‘on the ground’’. The Manager also had to maintain integration of infrastructure sustainability with the other work streams and organisational processes, including with environmental compliance and safety, especially since the SuMS was part of the SSHEQ.

**Figure 9** – ODAT organisational structure for sustainability

At the ODA level, there were a number of different sustainability teams, including environmental sustainability and social sustainability teams. According to interviewee OS3, there was no one sustainability leader, but a number of sustainability advisers looking

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640 Ibid.
641 Adapted from a copy of ODAT’s organisational chart, sent to the author via email from interviewee OL1 on 12 May 2010.
642 Interviewee OS3.
after the various sustainability ‘work-streams’. As an example, one work-stream concerned embedding environmental sustainability commitments and initiatives into design, construction and other processes associated with the Games and in particular the different venues including the Olympic Stadium. The head of this work-stream had the title of the Head of Sustainable Development and Urban Regeneration. His team included approximately 17 sustainability advisers.

(c) Sustainability Advisers – Attributes, Roles and Responsibilities

The roles and responsibilities of ODAT’s sustainability advisers, and other project team employees, are also defined within the SSHEQ. Relevant job descriptions also include responsibilities for infrastructure sustainability and sustainability outcomes. Unfortunately, the author was unable to view an example of these job descriptions.

However, interviewees revealed much about the role of various project team employees in developing sustainability outcomes for Orient Way. In order to achieve the desired good environmental performance for Orient Way, including in energy efficiency and reduced carbon outputs, many discussion were had ‘around the table’ between the Head of Transport Systems and Games Safety, the Head of Capital Rail Projects and other project employees such as the Project Manager and the Site Safety Manager. The designer Atkins also came up with some good ideas. As discussed by interviewee OD2, ‘it was not one person who could be attributed to having the idea, the mastermind’. This highlights the importance of collaboration in developing sustainability outcomes for a project. A more formalised approach to this collaboration is discussed in Part V Section 10, and Part VI Section B(1) on workshops.

The sustainability advisers, and some individuals in leadership roles such as the Head of Transport Systems and Games Safety, were instrumental in overcoming some of the challenges presented. This is evident in the comment made by interviewee OD1 above in relation to the contractors being forced to adopt CEEQUAL. There was therefore a degree of capacity building of these contractors that took place, discussed further in Section 12 below.

643 Interviewees OD2 and OE1.
644 Interviewee OD2.
It is therefore reasonable to conclude that the ODAT leadership-level commitment and passion for sustainability was critical in overcoming such challenges. A key driver for these individuals was ODA corporate sustainability policy and commitments, and even the CEO’s commitment to the realisation of infrastructure sustainability and sustainability outcomes ‘on the ground’. Interviewee OS2 explained that:

David Higgins, during his time as CEO of ODA, worked to develop and implement standards and processes that were best practice, but were ‘tried and tested’ to provide surety of delivery. You have to balance innovation with risk of delivery, especially on such high profile projects with a tight program and fixed budget. Providing value for money was also a key objective.

Interviewee OL2 had similar sentiments, but spoke about sustainability and leadership more broadly:

It’s your chief executives that generally are the ones that will drive sustainability through the organisation. And it’s about leadership. It’s about having strong leadership at the top, and true commitment.

He added that having the ‘right supporting mechanisms’, including resources for sustainability and ‘people that know and understand the technology side of it’, was critically important ‘because boards are very good at committing to things but don’t necessarily understand what it is they are committing to. And they are not [the ones] seeing it through’.

Interviewee OS2 conferred with the importance of having technically capable sustainability advisers. He discussed how the sustainability advisers working for ODA had a broad knowledge of sustainability with specific capabilities and technical expertise in a certain area, for example in carbon management or biodiversity. Interviewee OS3 talked about these roles in further detail, stating that one specialist area was governance or the role of ‘program manager’, which included preparing the sustainability team to deal with the latest sustainability issues, and looking after reporting procedures. Interviewee OS2 stated that the Head of Sustainable Development and Urban Regeneration at ODA sought the ‘right’ people with relevant technical capabilities to fit the roles he needed within his sustainability team. The team therefore had what interviewee OL2 referred to as a ‘balance of

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645 Interviewee OS3.
competencies’. Some of the qualities the Head of Sustainable Development and Urban Regeneration looked for in his employees included being tenacious and playing an advocacy role. This team comprised of largely young individuals who were not established industry leaders but had potential, and were really passionate about sustainability and their particular field.

One interviewee discussed issues with using external sustainability advisers, and in particular Best Foot Forward who helped with the carbon footprint assessment for Orient Way. Interviewee OD2 states that:

> We (the rail project delivery team) just come up with our own ideas. We could have sat down with somebody but then you are spending a day talking about your business and what you are actually doing, and your ideas. So would it really be a worthwhile use of time? What we have seen is that they do not do it any better than you could do it yourself. They just collate the information that you give them. If you pay them, they will do anything for you, but it does not mean that they are right.

This suggests that having the technical capabilities ‘in house’ within the project organisation would be more beneficial in terms of level of understanding of the organisation and time. However there is always a danger of there not being enough work to sustain that position full-time. It would be more appropriate to have an employee that is able to focus short-term or part-time on an aspect like carbon, but who is also competent in other disciplines, such as environmental planning or design.

9 Decision-Support Tools

(a) Background

As discussed in Part III Section 6, decision-support tools are valuable for integrating sustainability into decision-making processes and include cost benefit analysis and risk assessments. Such tools are not necessarily useful in themselves – they need to be meaningfully applied and integrated into key decision-making processes, and into an approach to governing infrastructure sustainability, to achieve sustainability outcomes.

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646 Interviewee OS2.
647 Interviewee OS3. Also, according to interviewee OS2, many of ODA’s sustainability advisers were young women. This would make an interesting topic of further research from a sociological perspective.
ODAT uses various decision-support tools in the development and implementation of the approach to governing infrastructure sustainability. This Section describes the various tools used to support decision-making on infrastructure sustainability, including challenges in integrating them into decision-making and project delivery processes, and how such challenges are, or are not, being overcome. It uses the Orient Way and West Ham projects to highlight the discussion where appropriate.

(b) ODAT Approach – Tools for Key Sustainability Themes

ODAT applies various tools to address the three key sustainability themes of healthy living, inclusion and climate change. For healthy living, such tools relate primarily to the early stages of project delivery where the types of projects, such as the extensive network of bike and pedestrian paths, are being planned and funded. As part of this early planning stage to address the theme of healthy living, ODAT commissioned a health impact assessment. This assessment evaluated the potential for the transport plans to achieve the sustainability objectives and targets in the healthy living theme, for example through the promotion of more walking and cycling.648

To address the key theme of inclusion, ODAT has undertaken significant amounts of research into the needs and interests of disabled people. As stated in the Accessible Transport Strategy, ODAT is committed to conducting research into accessible transport delivery to inform transport planning for the Games, and to sharing ideas and examples of best practice.649 Of particular importance is the Accessible Transport Panel, comprising representatives from the disabled community and other key stakeholders, which is used to discuss issues such as disability equality training and customer care standards and policies.650 ODAT has also been working with its transport delivery partners such as TfL to ensure that essential access facilities, including automatic doors and induction loops, operate fully in the period leading up to and during the Games.651 Such research and partnership has been

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650 Ibid.
651 Ibid.
assisting ODAT make informed decisions about the shape and form of facilities to implement as part of its program of works, such as provision of a new lift as part of the West Ham project works.

Tools used in the implementation of infrastructure sustainability within the climate change theme relate primarily to abatement of carbon emissions. As stated above, a base-case carbon footprint study of transport projects was undertaken as part of a broader footprint study of the whole Games by LOCOG and ODA. A tailored carbon footprint methodology and a reference footprint were developed as part of this assessment. It was undertaken by the consultancy Best Foot Forward, was overseen by a client steering group from LOCOG, the ODA and the Land Development Authority, and supported by a Technical Advisory Group comprising individual specialists. The carbon footprint study informed the development of the carbon management strategy for the Games.

The transport infrastructure for the Games is estimated to represent 9 per cent of total emissions for ODA owned assets in the reference footprint assessment. Orient Way was the only project under full control of ODAT and thus a full carbon footprint was undertaken for this project. On other projects such as West Ham, ODAT only has partial control, with ownership and responsibility shared with organisations such as Network Rail, and hence ownership and responsibility of the carbon emissions is also shared. The carbon footprint study of Orient Way was undertaken by the principal contractor, ODAT and Best Foot Forward as the first construction project to be delivered as part of the Games.

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653 Also known as a ‘base line’ carbon footprint. It represents a ‘business as usual’ carbon output for the Games, which is based on initial designs or specifications and typical construction practices; compliant with any statutory or other requirements without adopting any active carbon abatement strategies. The reference footprint therefore allows for reductions to be quantified in context. Ibid 18.
655 Ibid.
656 Ibid 29.
657 Ibid 67.
(c) ODAT Approach – Sustainability Performance Assessment Tools

(i) Overview

ODAT was active in the application of sustainability performance assessment, including rating, tools. As discussed above, ODAT made the use of CEEQUAL mandatory through contractual mechanisms. According to interviewee OS1, ODAT looked for a ‘recognised, demonstrable certification’ to ensure environmental compliance with relevant legislation and to achieve beyond-compliance environment and social outcomes. CEEQUAL was determined to be the most appropriate for application across the various transport infrastructure projects.658 Also of relevance is the aforementioned Code of Construction Practice which is used in support of construction environmental management activities. The purpose and function of the Code is outlined in Section 6 above.

ODA is applying the UK Building Research Establishment Environmental Assessment Method (BREEAM) tool in the development of its buildings and venues, and as will be discussed in Section 11 below, is participating in further developing and advancing the BREEAM tool. However, an analysis of the implementation of BREEAM by ODA is outside of the scope of this thesis because it does not directly relate to ODAT’s transport infrastructure project delivery activities.

(ii) CEEQUAL as a Decision-Support Tool

CEEQUAL appears to have been largely beneficial as a decision-support tool for ODAT. According to some interviewees, CEEQUAL allowed project team members to understand what was possible on the various projects in terms of environmental and social initiatives.659

For example on West Ham, CEEQUAL provided a mechanism to develop and capture some environmental and social initiatives which otherwise may not have been developed. Interviewee OD1 discussed how the West Ham project team discovered that there was a long-running dispute between residents' groups, Thames Water and the local council that had been going on for about ten years. It concerned people throwing rubbish off the Greenway into

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658 Interviewees OS1, OL2 and OL1.
659 Interviewees OS1, OL2 and OE1.
their gardens and damaging cars and other assets – and these stakeholders had not been able to reach a resolution.

Prompted by certain questions in the Effects on Neighbours section 11 of the CEEQUAL tool, the project team became aware of the issue, and took it onboard as part of their landscaping scheme. They put in high planting and framing, and training plants, to try to form a green screen to cut down this ‘unsocial’ behaviour. According to interviewee OD1, such initiatives have not added to project cost by any significant amount, but they are ‘initiatives that are actually making the most difference to the affected people’. He added that ‘without that type of mechanism [CEEQUAL], you wouldn't have anywhere particularly to discuss such initiatives’.

Further, regarding Orient Way, interviewee OE1 found CEEQUAL to be useful in promoting the project team’s thinking on what was possible in terms of sustainability outcomes, remarking that ‘even just reading the [CEEQUAL] manual promotes you to think about things. You look at it and you think, maybe we could be something like that’.

(iii) Linking CEEQUAL and ODAT’s Sustainability Commitments

In addition to the ability of CEEQUAL to prompt ODAT project team thinking about what is possible in terms of sustainability initiatives, it is also evident that to some extent, provisions in the CEEQUAL Scheme have been assisting ODAT in achieving its sustainability objectives, targets and other sustainability policy commitments. Interviewee OS1 in particular saw CEEQUAL as capable of addressing many of ODAT’s sustainability objectives.

A simple comparative break-down of the relevant sections of CEEQUAL’s assessment protocol and example questions against ODAT’s sustainability key themes of healthy living, inclusion and climate change, is provided in Table 4 below. This helps demonstrate the usefulness of the Scheme in achieving ODAT’s sustainability policy commitments.
**Table 4** – A comparative break-down of relevant CEEQUAL assessment protocol sections and example questions, and ODAT’s key sustainability themes

<table>
<thead>
<tr>
<th>ODAT Theme</th>
<th>Relevant CEEQUAL section/s</th>
<th>Example questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy Living</td>
<td>12. Human Environment, Aesthetics and Employment</td>
<td>12.4.2 Is there evidence that potential impacts of the project on the health and welfare of any occupants, users, neighbours and/or operational staff have been considered, and the design modified as a result?**</td>
</tr>
<tr>
<td>Inclusion</td>
<td>12. Human Environment, Aesthetics and Employment</td>
<td>12.4.5 Is there evidence that the needs of all different user groups have considered and respected in the design solution (for example, car drivers, cyclists, pedestrians, disabled people etc) and the specification achieved in the completed project?</td>
</tr>
<tr>
<td>Climate Change</td>
<td>1. Project Management 7. Energy and Carbon</td>
<td>1.4.2 Did the whole-life approach include consideration of the potential effects of predicted climate change scenarios, leading to appropriate adaptation strategies?** 7.2.1 Is there evidence that the design has considered options for reducing the energy consumption and carbon emissions of the project during operation, including the option of designing-out the need for energy-consuming equipment and the energy requirements in maintenance?</td>
</tr>
</tbody>
</table>

*Examples given in the manual include the provision of natural light within buildings, and incorporating the recommendations of a health impact assessment into design.

**As discussed above in Section 3, ODAT does not appear to have focused on climate change adaptation.

As is evident in Table 4, there is some connection between ODAT’s key themes of healthy living, inclusion and climate change and CEEQUAL’s assessment protocol. For example, question 7.2.1 supports the target of 50 per cent reduction in carbon emissions (see Section 3 above), albeit that CEEQUAL does not require actual targets to be achieved. In this instance, CEEQUAL indicates and rewards good process for reaching the 50 per cent target by prompting designers to consider options for designing-out energy consuming equipment, such as inefficient station lighting. Other questions within this section of the assessment protocol suggest similar processes to reduce carbon emissions.

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660 Adapted from the CEEQUAL manual, CEEQUAL, above n 38.
While CEEQUAL provides the prompts, there still needs to be a framework or approach in place for establishing sustainability objectives, targets and initiatives at early stages of project delivery, and then integrating them throughout the different project delivery processes. CEEQUAL is not an approach to governing infrastructure sustainability itself. This is discussed further in the following section, and in Part V Section B(8).

Further, in relation to healthy living, many initiatives such as promoting walking and cycling modes of transport relate to early stages of project planning where the type of project to address a problem or need is determined. These stages are generally not covered by the CEEQUAL Scheme. Rather, CEEQUAL is more concerned with design and construction processes, evident in the types of awards and the questions within the assessment protocol.\(^{661}\)

Based on the comparative break-down, it is suggested that CEEQUAL could be more specific in how it addresses and assesses social issues if it is to be considered a sustainability performance assessment tool.\(^{662}\) Currently, there is significant weighting toward environmental issues in the assessment protocol, evident in the number of sections and questions pertaining to environmental issues. More specific social sustainability-related questions might include, for example, designing in audible and visual information into project design. Other recommendations for improving the CEEQUAL Scheme are provided in Part V Section 8 and in Part VII.

It can be concluded that generally CEEQUAL has been a good tool for ODAT to achieve sustainability commitments, despite the focus of CEEQUAL on environmental issues. However, limitations in its actual implementation and use were raised by various interviewees, and these limitations are discussed below. Further analysis and discussion of the ability of CEEQUAL to achieve sustainability outcomes is provided in Part V Section B(8).

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661 See in general the CEEQUAL Manual, CEEQUAL, above n 38.
662 CEEQUAL recently changed its branding to include the term ‘sustainability’. Specifically, it has changed from the ‘Civil Engineering Environmental Quality and Awards Scheme’ (hence where the acronym came from) to CEEQUAL – The Assessment and Awards Scheme for Improving Sustainability in Civil Engineering and the Public Realm.
Part IV Section B

(iv) CEEQUAL Guidance on Governing Infrastructure Sustainability

The use of a Scheme such as CEEQUAL needs to be accompanied by other initiatives and processes to achieve infrastructure sustainability (as will be further discussed in Part V Section B(8)). Sustainability performance assessment tools should only be one tool in the ‘tool box’. This is especially true considering that CEEQUAL is primarily concerned with assessment and rating, as opposed to providing direction and guidance for developing an approach to governing infrastructure sustainability.

That CEEQUAL provides limited guidance on developing an approach to governing infrastructure sustainability is evident when analysing the first assessment section in the CEEQUAL assessment manual titled Project Management. Within this section, there are several questions and background information relating to governing infrastructure sustainability. Under subsection 1.1. Basic Principles, the manual refers primarily to CEEQUAL’s ability to complement environmental management mechanisms, such as EMSs. Subsection 1.1 states that CEEQUAL can ‘function partly as a ... specification for the project’s environmental management processes and partly as a checklist for environmental and social issues’. 663

The Project Management section also discusses the importance of environmental management mechanisms, such as on-site using construction environmental management plans. It highlights the importance of linking environmental commitments made at different delivery stages and processes, such as integrating contents of planning approval consents with design processes. 664 The assessment protocol then provides information on contractual and procurement processes in subsection 1.3, where the power of the proponent to drive sustainability outcomes through procurement mechanisms is discussed. Other key issues outlined in the Project Management section of the manual – and which have accompanying assessment questions – include planning for life-time operations (consistent with the principle of whole-of-life thinking discussed in Part I Section A(2)), application of ‘best practice’, choice of construction process, and other construction issues such as choice of equipment.

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663 CEEQUAL, above n 38, 7.
664 Ibid 9.
The assessment protocol includes setting environmental and social performance targets for the construction and operational stages during design processes. However, it does not provide guidance on or discuss how such targets should be negotiated and developed, or how they fit into a framework or structure for governing infrastructure sustainability (as provided for in Part VI).

Question 1.2.6 of the Project Management section has particular relevance to governing infrastructure sustainability. It asks ‘is there evidence that the project team actively considered the principles of sustainable development in the planning, design, and construction of the project?’ The maximum score for a client award is then ‘10’, design ‘6’, and construct ‘2’, suggesting that CEEQUAL recognises the importance of, and rewards the proponent having, an approach to addressing infrastructure sustainability early on in project delivery, as opposed to relying on later project delivery stages which may prove too late. The supporting text below this question states that ‘this question is looking for whether there is an overarching objective within the project team to consider the broader concepts of sustainable development within the project decision-making’. 665

Question 1.2.6 then references the Royal Academy of Engineering’s guide Engineering for Sustainable Development: Guiding Principles from 2005 and provides the web link to this document. No other guidelines or frameworks are referenced. This is a limitation because the aforementioned guide relates specifically to design processes, as opposed to managing infrastructure sustainability across other project delivery activities. 666 Also, it not only applies to infrastructure design processes, but also to other engineering disciplines such as manufacturing – making it broad in scope. Evidence for users to provide to get a score for question 1.2.6 is said to possibly include ‘a sustainable development policy that cascades into a project sustainability framework for the project. Further evidence that this has received active consideration could include design team meeting records, or a sustainability assessment or appraisal report’. 667

665 Ibid 11.
667 CEEQUAL, above n 38, 11.
Despite provisions in question 1.2.6 and the supporting information, a key observation is that there is still limited guidance for developing a sustainability policy, strategy or plan, project-specific sustainability objectives and targets (although there is some discussion on targets as above), or any of the other key components integral to a framework for governing infrastructure sustainability.\textsuperscript{668}

Further, question 1.2.6 seems out of place in that a framework – a term even included in the evidence statement for this question – should ideally encompass and ‘sit above’ many if not all of the other questions within the Project Management section. The way the question is presented within section 1.1 of the assessment protocol indicates that addressing and considering infrastructure sustainability is separate to the other questions and issues. This would likely be confusing for those applying the tool. For example, the questions relating to setting targets during design for construction and operation and the supporting information does not cross-reference question 1.2.6, or discuss how the setting of targets would interface with design processes. Hence, there is a considerable degree of compartmentalisation of the key governing infrastructure sustainability provisions in the CEEQUAL Scheme.

Other issues associated with CEEQUAL are further discussed in Part V Section B(8). However in summary, while the questions in the Project Management section of CEEQUAL should be considered in the development of any approach to governing infrastructure sustainability if the proponent and/or delivery partner is seeking a CEEQUAL rating, it cannot in itself provide a framework for governing infrastructure sustainability. This is largely because the aim of the Scheme is to facilitate an assessment and rating, as opposed to being a guideline in itself. It may become far too onerous or prescriptive if it were to include a framework for governing infrastructure sustainability. Such a framework is better articulated in a different format and owned by a different kind of organisation. Such a format would include academic research outputs, as per Part VI of this thesis, as part of a government and/or proponent guideline, or developed as a tool by a consultancy for use on its clients’ projects. However, an organisation such as CEEQUAL could reference and provide

\textsuperscript{668} See in general Part VI.
links to such frameworks or guidelines on its website once they are available and are deemed appropriate.669

(d) ODAT Approach – Cost Implications

The economic dimension of sustainability can often be forgotten in the literature on infrastructure sustainability. Clearly however, sustainability objectives, targets and initiatives have to be financially viable in order to be feasible and palatable because in reality, there will be budgetary limitations on virtually every infrastructure project.

As discussed in Section 4 above, monetary cost is a key decision-making factor for ODA and ODAT. Speaking about the relationship between cost savings and sustainability initiatives adopted by the ODA broadly, interviewee OS2 discussed how some of the sustainability initiatives have required additional investment, whereas other initiatives have been achieved at a cost saving, while some are ‘cost neutral’.670 As an example, interviewee OS2 stated that many of the carbon emission mitigation initiatives have required additional investment. The cost profile of an initiative depends on factors such as market availability of products and innovative technology.671

Interviewee OS2 discussed other benefits associated with sustainability initiatives including reduced running costs over the life of the development, improvements in health and well being, employing local people, improved air quality and enhanced biodiversity. He noted that ‘valuing these benefits can be complicated and subjective’. Nonetheless business cases have been developed for various initiatives that take into account such benefits where possible, and include examples of initiatives through benchmarking to demonstrate their viability. Interviewee OS2 also mentioned that ODA hopes to develop metrics to better quantify the benefits associated with the sustainability initiatives, and that such metrics will include the monetary savings that have been achieved.

For Orient Way, providing a business case for environmental sustainability initiatives was relatively simple because many initiatives amounted to a ‘win-win’. There was an

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669 See Part V Section B(8) and Part VII.
670 As in the monetary cost of an initiative is approximately the same as for a conventional initiative or approach.
671 Interviewee OS2.
environmental benefit in reduced carbon outputs, for example through the wind turbine or recycled content, and also there was a positive impact on upfront capital cost (from using recycled materials which were cheaper in this case, contradictory to interviewee OS2’s observations above) and/or operational costs (in reduced energy consumption through supplement of the wind turbine). These initiatives were therefore not difficult to justify.672

The issues of valuing benefits, estimating cost savings and other economic issues are discussed further in Part V Section B(8). It is worth observing that – as outlined in Part II Section C, and as mentioned by interviewees OS2, OL1 and OS1 – the budget for the Games is very large. This may have, in some instances, made the adoption of a strong sustainability position more palatable, and the financial imperatives less significant in decision-making – although this is largely speculative.

Funding for implementing and managing infrastructure sustainability and the overall governance approach to infrastructure sustainability, for example the SuMS, forms part of ODAT’s overall budget. At the early stages of the mobilisation of the organisation, ODAT developed an initial business case to obtain funding for such practice.673 New initiatives not in the original business case, and therefore original funding profile, require additional approval from the London 2012 Sustainability Board.674

(e) Challenges to Decision-Support for Infrastructure sustainability

There were a number of challenges to the development and implementation of decision-support tools. These challenges, and how they were overcome, can be separated into those relating to applying sustainability performance assessment tools, namely CEEQUAL, and availability and accuracy of data. Other challenges relating to decision-making for sustainability, for example in design and procurement processes, are discussed in the respective sections above.

672 Interviewee OD1.
673 Interviewee OS1.
674 Interviewee OS1. For more information on this Board, see Section 11 below.
(f) Challenges in Implementing CEEQUAL

In terms of the use of the sustainability performance assessment tool CEEQUAL, challenges included the large number of questions and other requirements associated with the assessment protocol, and resources needed to complete an assessment. Interviewee OD1 remarked that CEEQUAL is ‘enormous and quite intimidating to confront ... because there’s so much information in there’. Interviewee OS1 was also concerned about the resources needed to apply the tool, including with respect to educating other project team members and delivery partners on the tool:

CEEQUAL is quite a laborious process to go through. It’s quite repetitive as well. And what we had to do was involve the designers and we found that we were educating the designers on the process as well. We spent quite a lot of time going through it with the designers and the construction leads as well, to go through exactly what was required. Ideally everyone should go through some level of training before. It takes a lot of time putting together all the evidence that is required for it as well.

In Version 4.1 August 2010, the Manual comprised 208 questions and 115 pages including all the supporting information. However, a number of those questions would be ‘scoped out’ as part of the scoping process included in the assessment protocol.675

According to interviewee OE1, although the cost of putting in an application to the CEEQUAL administrators was relatively small, ‘putting together the information [was] a full time job’, requiring significant amounts of time sourcing and compiling the relevant information. He added:

It was a bit of a learning curve for me. If I did it now, I would be a lot of clearer from the early stages of what information I needed, and I would be getting it every week. Instead of leaving it to the back end. It was a bit stressful at the end. I would do things differently next time.

Therefore, although embedding CEEQUAL into procurement processes meant that contractors could price for it in their fees, unless they were experienced in applying the tool, they may not have had an accurate estimation of how much it was going to cost. As interviewee OE1 explained: ‘it is true that contractors can put it into their fees, but if I was a

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675 Scoping out is where the CEEQUAL assessor and verifier discuss and decide whether any individual assessment questions are not applicable or are irrelevant to the project being assessed, and therefore should be excluded from the assessment. CEEQUAL, above n 38, 10.
contractor, unless I knew a great deal about CEEQUAL, I wouldn’t know what or how much to cost’.

Interviewee OE1 then discussed how he had taken learnings from applying CEEQUAL on Orient Way onto other ODAT projects, including the West Ham project. He remarked how he had learnt from doing an assessment for Orient Way that ‘you need to be thinking early about what you need to do’. These findings relate to the capacity building and legacy discussions in Sections 12 and 13 below. This challenge of resource intensity in the application of CEEQUAL was therefore overcome incrementally through practice and training. However, in Part V Section B(8) and in Part VII certain improvements to the CEEQUAL Scheme itself are suggested that would allow for better preparedness and efficiencies in the application of CEEQUAL to a project.

(g) Availability and Accuracy of Data

For ODAT, a key challenge in providing decision-support related to the availability of accurate data on the environmental, social and/or economic performance of certain sustainability initiatives. This lack of data was particularly an issue for specifying materials in design processes. A frequent observation by interviewees was that data on the environmental performance of some materials was poor, making it difficult to make informed decisions and achieve real sustainability outcomes. An example can be found in carbon data relating to materials. According to interviewees OS1 and OS2, many suppliers did not have detailed or accurate carbon data on their products and services. Interviewee OS1 further observed that the practice of carbon measurement is still somewhat immature, and complicated. Interviewee OE1 had similar sentiments. Speaking about the carbon assessment exercise for the Orient Way project, he suggested that ‘a carbon footprint assessment is highly reliant on the data that you give it. And there are so many variables, even if you have good data. I think it is quite difficult for that assessment to be accurate’.

The challenge of poor carbon data ties into an issue raised about the carbon footprint methodology and abatement process for West Ham. Interviewee SL1 discussed how the project team has been trying to understand what the carbon footprint actually means in relative terms, and whether there is ‘one target level, [or] serious target’ to be met.
To overcome issues associated with poor carbon data from products, ODAT researched and published a list of low carbon material options that contractors can procure. Not every material used to construct transport projects is included in the list, only materials used in the greatest quantity and as a consequence likely to have the greatest impact. The list includes items such as low-carbon concrete, recycled steel and recycled plastic block. The list is provided to designers working on ODAT projects to include within their specifications.

10 Measuring, Monitoring and Reporting

(a) Background

Measuring, monitoring and reporting relates to establishing and selecting indicators through which to measure, monitor and report progress toward sustainability objectives and targets. As discussed in Part III Section B(11), it is an iterative, adaptive process. Sustainability objectives and targets may need to be reviewed and revised as the project progresses to reflect internal or external changes, including those relating to technology availability. This process can therefore facilitate continuous improvement.

This section describes ODAT’s approach to measuring, monitoring and reporting, including its processes for ensuring compliance with the SuMS and on-going management of sustainability requirements in design and construction stages. The interface between ODA and ODAT is particularly important with respect to the measuring, monitoring and reporting system.

(b) ODAT Approach to Measuring, Monitoring and Reporting

(i) Monitoring and Reporting Procedures

ODA’s approach to evaluating current and target sustainability performance includes an annual London 2012 Sustainability Plan Progress Report Card. This report card provides a comprehensive account of progress on the commitments detailed in the London 2012 Sustainability Plan. The report card documents the initiative, commitment, lead organisation,

676 Whittaker et al above n 206, 33.
677 Ibid.
678 Ibid.
how the progress is measured for example qualitatively or quantitatively, and any future activities and key milestones. \(^{679}\) ODAT’s performance against its sustainability objectives and targets is also tracked through this process. The report cards are reviewed by the Commission for a Sustainable London 2012. \(^{680}\) The Commission monitors the sustainability performance of the whole of LOCOG, providing the external public assurance for the overall sustainable development program for the Games. \(^{681}\)

ODA also developed monthly ‘dashboard’ reporting, which is essentially a web-based reporting system. Reporting concerned issues such as health, safety and environment, and had a cross cutting theme of sustainability. It is required for each project including the different venues and transport projects. \(^{682}\) Dashboard reporting on sustainability is tied to the themes such as healthy living and climate change, so that these themes act like high-level indicators. In this dashboard, there are a whole host of questions and information to upload, and according to interviewee OE1, it takes about half a day each month to upload all of the data from the rail project delivery arm. Each report nominates a red, amber or green light for each theme to indicate how it is tracking against that indicator. This reporting protocol includes a section for commentary where justification for the score is provided by the reporter. ODA then tracks how the different areas are performing against ODA’s legislative requirements and commitments (including conditions of consent as discussed in Section 5 above), including on sustainability.

ODAT also produces written Quarterly Transport Sustainability Reports. These Reports relate to all of ODAT’s activities, rather than a particular project, and are provided to both ODA and the London 2012 Sustainability Board. The London 2012 Sustainability Board represents both LOCOG and ODA and is the ultimate, leadership-level decision-making body on sustainability issues. A copy of a Quarterly Transport Sustainability Report from 2010 was viewed by the author, but cannot be referenced or discussed in depth due to confidentiality. However, interviewee OS1 provided some insights into the process.

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\(^{679}\) Olympic Delivery Authority Transport, above n 523, 17.
\(^{680}\) Ibid 9.
\(^{681}\) Whittaker et al, above n 206, 22.
\(^{682}\) Interviewee OS3.
The Quarterly Transport Sustainability Reports are separated into the three headline themes of climate change, healthy living and accessibility. They outline how ODAT is reaching the various targets under each headline theme, including for example 100 per cent of spectators to travel to all venues by public transport, walking and cycling. Additional targets are reported on that are not found in the Sustainable Development Strategy and the London 2012 Sustainability Plan. For example, there is a target relating to rail projects achieving the ‘very good’ CEEQUAL rating, a target arising from the sustainability requirements found in procurement processes.

Similar to the dashboard reporting, the Quarterly Transport Sustainability Reports adopt the red, amber, green light format to indicate conformance with the targets. The reporter also has to provide justification as to how each target is being met. The Reports include discussion on progress made since last report, challenges to meeting the targets, and plans for the next quarter.

There are therefore clear incentives for different parties to deliver on ODA’s sustainability commitments because if they do not meet the relevant targets, they will have a ‘red’ mark in their monthly or quarterly report. This would not be favourable because it would likely lead to negative attention from the leadership team, and has potential financial implications for the parties involved because good performance in various areas is written into the relevant contractual arrangements. This means that reaching the sustainability targets became key performance indicators for these parties. ODA has an incentive to see that red cards are kept to a minimum to minimise negative publicity.

It was observed by both interviewee OD2 and OS3 that if targets are not met, then there needs to be good reason, such as targets presented a health and safety or other issue. Interviewee OD2 added that ‘it couldn’t be because we couldn’t be bothered – that wouldn’t fly ... however they are aspirational targets that need to translate in reality’. This task of

683 See Section 3 above.
684 Interviewee OS3. See Section 6 above. Also see below.
685 According to interviewee OS3, the public can at any time ask to view data associated with the Games because it is government funded. If the sustainability commitments were not being met, this could be a cause for concern for the public.
686 See Section 4 above and Part V Section B(4).
translating the targets ‘on the ground’ can face challenges including those associated with the unstable knowledge base as discussed in Section 4 above.

In terms of ODAT’s individual employee key performance indicators, within each employee contract there is a condition on the need to work in compliance with the SSHEQ, which includes the SuMS and the London 2012 Sustainability Policy. Further, compliance with sustainability requirements is linked to performance bonuses, and individual performance on key performance indicators is reported monthly through formal management meetings to the Transport Director.\(^{687}\) Specific examples of these key performance indicators could not be found for the purposes of this research.

Project Status Reports also allow monitoring of project performance including sustainability performance information. According to OL3, for Orient Way these Project Status Reports were required monthly to ODA. There are no indicators attached to the Report with respect to sustainability – discussion on sustainability progress is more descriptive in nature. Any issues identified in the Project Status Report, including those relating to environmental compliance but also relating to sustainability performance, are captured and escalated to the Transport Safety Committee. This Committee evaluates the issues and authorises action plans to enable the issue to be effectively closed out.

(ii) Sustainability Management System – Verification, Auditing and Compliance

In addition to adopting these reporting procedures, ODAT ensures compliance with its SuMS and its sustainability commitments through second party assurance and compliance reviews via programmed sustainability audits.\(^{688}\) The agencies primarily responsible for the verification and audit are ODAT itself through its internal audit teams and the Commission for a Sustainable London 2012.\(^{689}\) Any issues of non-compliance identified, for example through the internal audit program, are reviewed and evaluated. Documented action plans are then put in place which details the actions needed to amend the issue, and are then formally

\(^{687}\) Interviewee OS1.

\(^{688}\) Olympic Delivery Authority Transport, above n 523, 18.

\(^{689}\) Whittaker et al, above n 206, 21; Olympic Delivery Authority Transport, ibid 18.
closed out with the responsible auditor and stakeholder. The action plans are tracked via an ‘action log’ which forms part of the SSHEQ.

The SuMS is also assessed by a third party certification body on a six monthly basis. The SuMS is assessed against the requirements of BS 8901. The certification body raises issues to be ‘closed out’ by ODAT, and provides recommendations for improvements to the system. The verification and audit systems utilised are crucial for keeping the delivery of the infrastructure sustainability initiatives on target.

The Head of Transport Systems and Games Safety is responsible for ensuring that management reviews of the SuMS, including by ODAT’s leadership-level, take place. The management reviews focus on three areas i) opportunities and improvement identified from previous management reviews and audit results, ii) developments of appropriate recommendations to address any issues identified, iii) how best to communicate agreed actions with employees and other stakeholders, and iv) how to integrate the issues into future management plans.

This system results in infrastructure sustainability being constantly monitored and reported, with assurance being awarded where appropriate. According to Whittaker et al, ‘this level of commitment to assurance will drive excellence in the industry and has a better chance of enduring after the Games, and of being translated into other infrastructure projects’. This is largely because the SuMS is based on an established standard that can be adopted on other projects; and documenting the successes and failures in its implementation will provide lessons learnt for other projects and industry at large.

(iii) Communicating to External Stakeholders

According to interviewee OS2, ODA ‘puts a lot of effort into communicating and reporting progress to the community’. For example, regular, program-wide six monthly sustainability

690 Olympic Delivery Authority Transport, ibid 17 and 18.
691 Ibid, 18.
692 Ibid.
693 Whittaker et al, above n 206, 21.
694 Olympic Delivery Authority Transport, above n 523, 18.
695 Ibid.
696 Whittaker et al, above n 206, 23; See Section 12 below.
forums are held by London 2012 where internal and external stakeholders (including the
Commission for a Sustainable London 2012) have an opportunity to discuss progress on
infrastructure sustainability and sustainability outcomes. ODA and ODAT publish numerous
sustainability-related documents on the London 2012 website.\(^697\) For example, the
Sustainable Development Policy and Sustainable Development Strategy are available on the
London 2012 website.

Further, the Commission for a Sustainable London 2012 produces annual audit reports on
ODA’s Sustainable Procurement Policy, which are made publicly available.\(^698\) The
Commission also reviews aspects of ODAT’s sustainability performance including through
the report All Change – A Snapshot Review of Sustainability and Transport across the
London 2012 Programme. The June 2012 All Change report went into significant detail about
ODAT’s infrastructure sustainability activities and sustainability outcomes, exploring how
London 2012, and ODAT, were meeting their various transport sustainability commitments
relating to the key themes of healthy living, inclusion and climate change.\(^699\) The level of
detail in the Commission for a Sustainable London’s reports indicates that ODA and ODAT
generally provide unrestricted access to its project documentation. This commitment to
openness and transparency is a good indication of a commitment to stakeholder
communication and inclusion.

ODAT communicates and reports to external stakeholders through ‘Pace’, or transport
update, reports. These reports generally provide information on how ODAT is progressing
toward its sustainability objectives and targets, and delivering sustainable transport
infrastructure overall.\(^700\) For example Issue 7 from June 2010 provided information about the
spectator-powered lighting trials at West Ham.\(^701\) Contact details are provided within the
document so that the public can reach relevant ODA or ODAT employees for further
information.\(^702\)

\(^698\) Commission for a Sustainable London 2012, above n 592.
\(^700\) See for example Olympic Delivery Authority, above n 200.
\(^701\) Ibid 6.
\(^702\) Ibid.
ODA’s sustainability advisers were not responsible for communicating on sustainability performance with the community, as there were specific communication employees who took on this role. They would, however, attend some meetings as required to answer any technical questions. The sustainability advisers did communicate directly with industry organisations, such as when testing the sustainability targets as discussed in Section 6 above. Further, ODAT’s Sustainability Manager collaborates with agencies such as TfL as required in the implementation of its initiatives.

(c) Ongoing Management of Sustainability Requirements

Unlike the Sydney Metro project, ODAT’s projects including Orient Way have gone ahead, and as such it is possible to discuss how sustainability requirements specified through procurement processes are being adhered to in the on-going delivery of projects (namely during construction). Indeed, Interviewee OS2 remarked that ‘having sustainability requirements in tenders is really important, but the real question is will they do what they say they will? Are they actually committed?’ He added that ‘this is why you need a strong auditing and assurance process – to check that companies deliver on their sustainability commitments and requirements’.

To manage the delivery of the sustainability objectives and targets across the construction program, ODAT’s contractors are required to regularly report on progress against agreed sustainability indicators. This process is supported by CEEQUAL (as it can be used to assess performance following construction as per the whole project or construction award) and the Considerate Constructors Scheme. The Considerate Constructors Scheme encourages attainment of environmental excellence in civil engineering projects and all of the Games site works are registered under the Scheme. It is a not-for-profit scheme, which was founded by the industry and funded by registered companies with the aim of improving the image of the construction industry. In order to be a member of the Considerate Constructors Scheme, a contractor must demonstrate compliance with the Scheme through an assessment that

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703 Interviewee OS3.
704 Interviewee OS1.
705 Interviewees OS1, OS2 and OS3.
706 Whittaker et al above n 206, 21.
707 Ibid.
includes an on-site audit of practices. This Scheme is separate to the aforementioned Code of Construction Practice which is an ODA policy and guidance document.

Also of relevance to on-going management of sustainability requirements is the Code of Construction Practice outlined above, which essentially provides a construction environmental management protocol. The Code is linked to a broader EMS for the development of the Olympic Park which was developed by the ODA. The EMS sets out the arrangements and responsibilities for implementing, auditing and enforcing the environmental mitigation measures set out in this Code. As part of the EMS, Environmental Management Plans are required to be developed for each project site. This thesis does not go into detail on the EMS because – although it is critical in ensuring on-going environmental performance and outcomes – it is a ‘business as usual’ practice that is not in itself an approach for governing infrastructure sustainability. ODAT’s approach to governing infrastructure sustainability has more sophisticated elements, as discussed throughout this Part.

The Code is also enforced through mechanisms including the conditions of consent for site preparation and remediation, and the construction of the Olympic Park venues and other infrastructure. The ODA environment managers and construction managers are required to monitor and report on compliance with the Code to the ODA Director of Construction, as is the Delivery Partner Head of Construction on receiving reports from relevant project managers.

(d) The Challenge of Measuring Sustainability Outcomes

The key challenges raised by interviewees with respect to measuring, monitoring and reporting included the poor data availability and other constraints associated with measuring infrastructure sustainability and sustainability outcomes.

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708 See Part I Section A.
709 Olympic Delivery Authority, above n 615, 7.
710 Ibid.
Part IV Section B

As discussed in Section 9 above, the measurement of social benefits from the healthy living initiatives, such as those relating to cycling and walking, was raised as an issue.\(^{711}\) While the physical and psychological benefits associated with such initiatives are difficult to dispute, developing metrics to measure social benefit can be problematic.\(^{712}\)

The measurement of carbon was also seen as an issue, as discussed in Section 9 above. Interviewee OL1 also had some concerns regarding the measurement of carbon. He noted that it is all very well to have a carbon estimation for a particular project, or component of a project such as the construction process, but unless there is something to compare that measurement to, so a specific benchmark, it is not particularly meaningful. He further explained that:

> Improving our carbon footprint is complicated – is there one target level, serious target? Is there a measure we can have? If you've got a carbon output, what does that mean? What are you comparing it to? Having just a number without context doesn’t mean anything.

Interviewee OD1 concurred with these observations. Speaking of measuring the carbon footprint of construction activities, he observed that ‘a number doesn't mean very much unless you can actually tether it to ... something tangible. So [on West Ham] we're looking at how we can actually quantify whether it's a good number or a bad number’. Although ODAT sought a baseline carbon footprint, it is unclear whether it was specific to particular project processes such as construction activities. Although the reports of Orient Way achieving a 23 per cent reduction against its base case indicate that there was some way of comparing the carbon outputs, the comments from these interviewees suggest that this was not useful to the project team in the context of specific project processes, components and activities. Interviewee OS1 even believed that:

> It’s very difficult to measure the carbon footprint, and people have different views. If you look at materials, most of it has been done around the built environment rather than the rail environment.

\(^{711}\) Whittaker et al, above n 206, 33.
\(^{712}\) Ibid.
11 Knowledge Sharing and Capacity Building

(a) Background

As outlined in Part III Section 4, knowledge sharing and capacity building relates to promoting a sustainability culture, and information sharing on infrastructure sustainability and sustainability outcomes internally and externally. It is also about increasing the capacity of internal and external stakeholders to adopt infrastructure sustainability. Examples of activities and practices for knowledge sharing and capacity building were provided and included workshops and incentive schemes.

(b) ODAT Approach

(i) Training and Development on Infrastructure Sustainability

At the ODA level, training in safety, quality and infrastructure sustainability is critical and provided to all teams, including contractors, ensuring the sustainability approach is embedded throughout the entire Games program. On Orient Way, all ODAT personnel received environmental awareness training during the site inductions, including on initiatives necessary to meet the recycle and reuse targets and reduced carbon emissions target.

ODAT’s SuMS includes a process for improved competence and training on sustainability. The ODA Learning and Development Programme uses a range of different media to engage with employees, and is linked to the SuMS. Both existing and new employees are informed of their roles and responsibilities in relation to the SuMS through the Programme. Further, ODAT’s sustainability commitments and the need to comply with the London 2012 Sustainability Policy are conveyed through the employee induction program. As part of the Learning and Development Programme, ODAT utilises e-learning materials to facilitate training of its employees and delivery partners. These e-learning materials include an

713 Whittaker et al, above n 206, 21.
714 Interviewee OE1.
715 Olympic Delivery Authority Transport, above n 523, 14.
716 Interviewee OS1.
717 Olympic Delivery Authority Transport, above n 523, 14.
online facility for course users to appraise colleagues on a range of skill sets including on sustainability.  

When an employee’s role requires action on infrastructure sustainability, a training needs analysis is conducted to identify specific levels of training and competence requirements that shall be needed for the employee to effectively undertake their role. Training options include internal training courses facilitated by sustainability professionals, and external certified training courses where relevant. The Head of Transport Systems and Games Safety approves all sustainability training requests in conjunction with the Human Resources Manager. This training activity had a clear purpose of creating a ‘culture’ of sustainability. There is a significant amount of literature on organisational change and sustainability, including building a ‘culture’ of sustainability. For example, Hunting and Tilbury’s research into sustainability performance improvement within ten major corporate and government organisations revealed a number of insights into successful organisational change for sustainability. This included acknowledgment of the need to challenge and alter the underlying culture of an organisation including through education on sustainability and building participation. Interviewee OL2 also discussed the importance of ‘rewarding culture’ which has at its core sustainability thinking and practice. Rewarding or incentive schemes adopted by ODAT are discussed in the next section.

(ii) Incentive Schemes

The importance of incentive schemes in achieving sustainability outcomes was discussed in Part III Section B(4). An incentive scheme was applied during the construction of Orient Way. According to interviewee OE1, the scheme was called ‘Go for Gold’ and it involved contractors, supervisors and sub-contractors. It was a scheme that this interviewee had used

718 Interviewee OS1.
719 Olympic Delivery Authority Transport, above n 523, 14.
720 Ibid.
721 Ibid.
723 Ibid 2 and 14.
on previous projects as a positive reinforcement scheme for health and safety. He further described the scheme:

There are different levels. You do something that is poor practice, or dangerous – you get a red card. That might mean stop work, or undertake a mitigation measure to correct it. If you do something that is a little bit wrong but it doesn’t warrant you stopping the work, you get a yellow card. If you do something good, you get a green card and you get given a prize. They vary from 5 or 10 pound vouchers for supermarkets, but we also gave out big prizes – like a TV. Simple but effective.

c) Knowledge Sharing with External Stakeholders

According to the Sustainable Development Strategy, ODA plans to ‘share lessons learnt through the delivery of its Sustainable Development Strategy with industry, policy makers and other interested parties to improve standards within the construction industry and sustainable development’. In terms of infrastructure sustainability and sustainability outcomes, this plan for knowledge sharing has been facilitated through a number of means including communication via the London 2012 website, regular participation in events and working closely with industry to share information, for example as part of the CIRIA sustainability club. Most ODA sustainability-related reports and documents are available for download from the London 2012 website.

Further, ODAT hosts regular Safety and Sustainability Forums which are attended by transport delivery partners and stakeholders. A separate regulators forum specifically for the health and safety and environmental authorities also meets periodically. In addition, the Head of Transport Safety and Games Systems chairs an Active Travel Programme with stakeholders from TfL, cycling and walking groups, the Commission for a Sustainable London, and the National Health Service. Other individuals within ODAT also participate in external sustainability forums such as in CIRIA’s Sustainability Club, as outlined above, which provide valuable avenues for knowledge sharing with industry.

An appetite for knowledge sharing is also clearly demonstrated in the ODA and ODAT employees’ willingness to participate in the interview process as part of this research, which

724 Olympic Delivery Authority, 203, 58.
725 Olympic Delivery Authority Transport, above n 523, 16.
726 Interviewee OS1.
as discussed in Part II Section B, is an integral part of the research methodology. Another example can be found in a publication in 2010 which compares the approach to infrastructure sustainability and legacy planning of the Sydney 2000 Olympic Games to the London 2012 Games. Many of ODA’s and ODAT’s sustainability advisers were interviewed for the purposes of the publication and provided additional information such as reports. In addition, the publication supported a visit from ODA’s Head of Sustainable Development and Urban Regeneration to Australia late in 2010. The primary purpose of this visit was to share knowledge and experiences with the infrastructure and property sectors in the states of Queensland, NSW and Victoria.

(d) Capacity Building Internal and External Stakeholders

There have been many opportunities and activities relating to capacity building internal and external stakeholders, and this is viewed as imperative by ODA. For example, capacity building has been achieved through procurement processes. The requirement for CEEQUAL on ODAT’s projects has contributed to capacity building of both ODAT employees and contractors. For Orient Way, not only was one of ODAT’s staff required to undertake assessor’s training for the tool, but the contractor also went on the training course. Also, as discussed in Section 6 above, ODA has fed back to Constructing Excellence on how to develop a holistic set of sustainability indicators.

Further, the experience and lessons learnt from applying CEEQUAL will no doubt be taken onto other projects as project employees and delivery partners, such as the principal contractor, move on to other jobs. They may therefore be more inclined to suggest the use of CEEQUAL, and will be better prepared for its application, for example in terms of allocating resources for undertaking a CEEQUAL assessment. Other rail delivery partners such as TfL can also take the lessons learnt and potentially apply them within their organisations. So although these organisations may have different constraints to ODAT, for example in terms

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727 See in general Whittaker et al, above n 206.
728 The author was involved in this interview process and in writing the publication.
729 These events, titled Infrastructure Sustainability – The Olympics Legacy from Sydney to London, were hosted by the professional services consultancy Manidis Roberts and held in November/December 2010, see <www.manidisoroberts.com.au/events/2010/infrastructure-sustainability/events.html> at 21 February 2011.
730 Interviewee OS2.
731 Interviewee OE1.
of funding availability, the experience has at least allowed them to understand what is possible. As an example on Orient Way, the wind turbine and green roof\textsuperscript{732} promoted the interest of other stakeholders. Interviewee OD2 stated that ‘next door [to Orient Way] there is a Eurostar siding and the Eurostar staff started giving their managers a bit of grief, asking ‘why haven’t we got a green roof?’’. So we are changing people’s perceptions’.

Of critical importance to ODAT’s, and ODA’s, approach to knowledge sharing and capacity building is its contribution to the development of various sustainability performance assessment tools. Although not directly relevant to ODAT, ODA has been active in the further development of the Building Research Establishment’s BREEAM tool.\textsuperscript{733} ODA and ODAT have also provided feedback to the administrators of CEEQUAL in terms of opportunities for improving the tool.\textsuperscript{734} Further, according to interviewee OS1, the Sustainability Manager at LOCOG is involved in the ISO Committee and is taking lessons learnt from the implementation of BS 8901 back to the Committee.

(e) Lessons Learnt Exercises

The importance of lessons learnt on projects in general is discussed by Kagioglou et al.\textsuperscript{735} ODAT has been active in capturing lessons learnt relating to infrastructure sustainability on its projects. Such a process was undertaken for Orient Way in mid 2010, and according to interviewee OD2, both the ‘good and bad’ was documented. He added that ‘you have to be honest about it’. The timing of doing a lessons learnt exercise is also of importance, as interviewee OE1 amusingly remarked: ‘one of the lessons I have learnt is that it is a good idea to do [such an exercise] sooner, rather than two years after the project’.

The ODA has recently established a Learning Legacy Programme, which has been designed to capture lessons learnt, best practice and innovation from the Olympic construction

\textsuperscript{732} Green roofs are vegetated layers that sit on top of the conventional roof surfaces of a building. Junglefly, Green Roofs Overview \texttt{<http://junglefly.com/green-roofs.htm>} at 21 February 2011.
\textsuperscript{733} BREEAM is a voluntary environmental assessment method for buildings. It aims to promote sustainable design. Interestingly, the UK rail infrastructure delivery body Crossrail recently commissioned BRE to produce a bespoke version of BREEAM for its underground stations.
\textsuperscript{734} Interviewee OS2.
program for the benefit of industry, future projects and programs, and academia. Further information on the program could not be gathered for the purposes of this research. However, the outputs of this program should be reviewed in further infrastructure sustainability-related research.

12 Legacy

Capacity building of stakeholders, both internal – such as project employees – and external – such as delivery partner – is innately linked to legacy outcomes. As discussed in Section A above, legacy is a key driver for and factor affecting the whole Games program, and legacy planning is an important part of the Games. This commitment to legacy gave a boost to infrastructure sustainability, as long-term outcomes were generally at the forefront of decision-making, including for urban rail infrastructure projects. Such legacy thinking can be seen on the Orient Way project, as interviewee OD1 explained:

We talk about legacy, so what we are going to leave behind ... Our legacy for Orient Way was to leave a wind turbine and a green roof. That was something that we were giving back to the environment, the locals, and National Express the operator.

This commitment to legacy is even translated into ODAT’s contracts. For example, in the West Ham Project Information document, Section 6 is titled ‘Legacy’. It relates to what the West Ham project works will leave behind ‘post Games period’. This includes landscaping and a Greenway ‘legacy staircase’ and associated handrails linking Manor Road with the Greenway. ODA then refers to these legacy activities as the ‘legacy requirements’.

In addition to the physical legacy including infrastructure, affordable housing and environmentally sustainable technology such as renewable energy projects, of critical importance to legacy is the transfer of skills, knowledge and capability. Therefore, legacy is not just about what is physically left behind, but also about knowledge, capacity and empowerment left behind. This was highlighted by interviewee OD1 when discussing the construction industry’s propensity for adopting an infrastructure sustainability agenda based

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736 Interviewee OS2.
737 See Part VII.
738 Olympic Delivery Authority, above n 201, 20.
739 Ibid.
on ODA and ODAT’s clear mantra for sustainability outcomes.\textsuperscript{740} He stated that ‘the trick is taking that [commitment] and getting industry to do it all over the board rather than because it’s [related to the Games]’. Interviewee OS1 believed that such legacy outcomes were materialising for the transport sector, stating that ‘ODAT hasn’t actually built huge structures like they have for Olympic Park, but at the same time I think we are advancing the field of sustainable construction in transport’.

According to interviewee OS1, ODAT believes that part of the Games legacy could be the adoption of showcased technologies by industry. For example, if the spectator-powered lighting technology is tested and used at West Ham, there will be a legacy benefit as it could be used at other London stations.\textsuperscript{741} He further added that, ‘the idea is to be a catalyst for technological innovation by showcasing our suppliers’ technology and helping it to be rolled out across the whole transport network’. Further, using such technology increases the visibility and public awareness of the importance of sustainability to the Games. The use of the spectator-powered lighting technology at West Ham is ‘an excellent example of sustainability objectives leading to innovative solutions’.\textsuperscript{742} As discussed, such legacy outcomes also occur because delivery partner agencies, such as TfL, can apply their ODAT experiences to their organisations and their activities.

ODAT is also devising and implementing effective transport plans which provide for legacy use. And at the level of ODA, sustainable legacy plans for the Olympic Park and venues are also being developed and implemented. The legacy development will be set out within a Legacy Master Plan which is being developed in close consultation with stakeholders and local communities.\textsuperscript{743} More information on ODA and ODAT’s legacy planning activities can be found in various ODA reports.\textsuperscript{744}

\textsuperscript{740} See above Section 7.
\textsuperscript{741} Commission for a Sustainable London, above n 535, 12.
\textsuperscript{742} Ibid, 12.
\textsuperscript{743} Whittaker et al above n 206, 22.
Legacy is viewed as integral to the concept of infrastructure sustainability and sustainable development more broadly. It is also useful for setting up an approach to governing infrastructure sustainability, and setting objectives, targets and initiatives, and overall vision for sustainability. Legacy is rarely explicitly discussed in the literature on infrastructure sustainability or sustainability more broadly, or in industry dialogue around these concepts. Hence, it is articulated in the context of the framework presented in Part VI, and is further discussed in Part V Section 11.

13 Key Findings

This section summarises the key findings from the ODAT case study pertaining to the approach to governing infrastructure sustainability, and how key challenges were overcome. These key findings are compared and contrasted with those from the SMA case study in Part V. A framework for governing infrastructure sustainability is presented in Part VI based on theory developed in the comparative study.

(a) Prioritise Sustainability Themes and Ensure an Integrated Approach

In terms of the overall approach to governing infrastructure sustainability, ODAT inherited a number of policy commitment and associated documents from London 2012 and ODA. These included the London 2012 Sustainability Policy and Plan. ODAT then prioritised three key themes of inclusion, healthy living and climate change from these commitments as relevant to its transport program of works. ODAT has been innovative in that it has implemented and had certified its SuMS based on the Standard for sustainable event management BS 8901. SuMS has effectively formed the overarching framework for how infrastructure sustainability and sustainability outcomes are governed within ODAT, and SuMS is integrated with other project delivery processes and procedures, sitting within the overall SSHEQ.

(b) Use Planning Approval Processes to Motivate Contractors and be Aware of Design Constraints

Limited data was available on the interface between ODAT’s sustainability objectives, targets and initiatives and the planning approval process. However, some insights were gained from
ODA, including that sustainability targets and indicators were linked to conditions of consent and were used as a ‘stick’ to motivate contractors to reach the targets in question.

More information could be found on the interface with design processes and key findings include that design constraints including those relating to project program and cost may lead to some sustainability initiatives being ‘cut out’, and that the key design decision-makers have significant amounts of decision-making power because of such factors. This means that capacity building and holding to account those decision-makers on infrastructure sustainability is imperative. Further, the advantages in, and simplicity of, seeking opportunities with suppliers for the re-use of materials after project completion is an important finding.

(c) Clearly Articulate the Interface between Sustainability Policy and Procurement Processes, and Prompt the Procurement Team to Work with Sustainability Advisors

ODAT and ODA see the importance of – and are committed to – sustainability in procurement. This is demonstrated in the emphasis placed on sustainability in procurement in key policy documents including in the main procurement policy itself. ODA in particular worked and consulted with industry in the development of the sustainability objectives and targets to ensure that they were viable. This also prepared the industry for what would be expected of them in procurement processes.

For ODAT, sustainability requirements reflected its sustainability commitments and in particular the three key themes. The West Ham RFP documentation and the West Ham project information document provided valuable insights into specific sustainability requirements, including requirements for contractors to use the best endeavours to achieve an excellent CEEQUAL rating and to undertake a carbon footprint assessment. Further, a number of technical questionnaires used by ODAT effectively filtered out those contractors that did not have and/or could not demonstrate an existing infrastructure sustainability agenda. A key finding from reviewing the template used by the procurement team in developing RFP documentation was that the interface between the sustainability policy and procurement is made clear by ODAT; and further that the procurement team must liaise with the respective sustainability advisory team in developing the specific sustainability requirements for each project.
(d) Appreciate Limitations in Understanding, and Work to Overcome Constraints Associated with the Construction and Urban Rail Sectors

A number of challenges to implementing the approach to governing infrastructure sustainability were raised by ODAT interviewees. These included a lack of understanding of the ‘true’ sustainability on an initiative, and constraints associated with obtaining commitment to infrastructure sustainability from the construction industry, particularly in those organisations typically operating in the urban rail sector. Ways in which these challenges were overcome included working ‘on the ground’ with construction contractors; and in terms of gaining meaningful knowledge about the impacts of an initiative, applying reputable tools including those providing robust LCA methodologies. Other challenges relate to inflexible rail standards and a culture of risk aversion within the urban rail sector, which has led to the perception that sustainability initiatives may present an unnecessary risk.

(e) Encourage Collaboration on Infrastructure sustainability and Seek Advisors with Desirable Attributes

With respect to roles and responsibilities, the SuMS clearly assigned responsibility for infrastructure sustainability including to the leadership-level of ODAT. Key sustainability advisers included the Head of Transport Systems and Games Safety and ODAT’s Sustainability Manager. However in practice, evidence indicated that it was not one person or a couple of people who came up with innovative ideas but rather was a result of collaboration between both sustainability and non-sustainability advisers. Data regarding capabilities came primarily from ODA and included having relevant technical capacities in terms of fitting the roles, and in terms of attributes or personality qualities, being tenacious and playing an advocacy role.

(f) Appreciate that Sustainability Performance Rating Tools are One Tool in the Tool Box, and Seek to Value Benefits Associated with Sustainability Initiatives

CEEQUAL has been used as a key decision-support tool by ODAT. It has assisted in the understanding of what was possible in terms of social and environmental initiatives on various projects. At the same time however, the CEEQUAL Scheme in itself is acknowledged to be just one tool in the ‘tool box’, and further it does not provide robust
guidance on how to develop and implement an approach to governing infrastructure sustainability. Some challenges in applying CEEQUAL have included the extensive number of questions and other requirements associated with the assessment protocol.

Valuing benefits was identified as a key challenge to decision-making for sustainability, but such benefits are taken into account when developing business cases for certain initiatives where possible. Further, poor availability and accuracy of data can restrict informed decision-making, particularly with respect to carbon management. ODAT has overcome such a challenge in part by researching and publishing a list of low carbon material options that contractors can procure.

(g) Use Programmed Sustainability Audits to Monitor Progress and Communicate to Internal and External Stakeholders

ODAT’s approach to measuring, monitoring and reporting includes an annual Report Card, monthly reporting on a web-based system, and Quarterly Transport Sustainability Reports which address the three headline themes of inclusion, healthy living and climate change. These reporting mechanisms provided incentives for different parties to deliver on ODAT’s sustainability commitments including through the allocation of red, amber and green ‘lights’ on performance. Compliance with the SuMS is assured through programmed sustainability audits and second party assurance. ODAT is also committed to reporting to its external stakeholders on infrastructure sustainability performance, including through the publication of sustainability performance reviews. External assurance and review is provided by the Commission for a Sustainable London 2012, along with other relevant bodies.745

(h) Use Various Forms of Training Media and Share Knowledge – Including in Order to Achieve Legacy Outcomes

With respect to capacity building, ODAT is active in training employees and contractors. This includes on-site. Different forms of media are used, including e-learning materials. This training activity has a clear purpose in creating a ‘culture of sustainability’. ODAT is also committed to knowledge sharing, evident in the extent of sustainability-related information

745 See Section A above.
available on the London 2012 website. Capacity building contractors has also taken place organically through procurement processes because the experience and learnings in addressing the extensive sustainability requirements will no doubt be taken onto other projects in legacy. Such legacy considerations are inherently linked to the concept of infrastructure sustainability, and indeed adequate planning for achieving legacy outcomes, whether it be the physical infrastructure or knowledge, capacity and empowerment left behind, will likely result in sustainability outcomes.

C Conclusion

This part responded to the research questions pertaining to the ODAT case study. The key drivers for addressing infrastructure sustainability were discussed and included the nature of the Games as transformational and the focus on legacy outcomes, as well as community and stakeholder sustainability imperatives. ODAT’s approach to governing infrastructure sustainability was then described, including key challenges to implementing this approach and how they were overcome. The key findings arising from the case study were then summarised. The next part presents the comparative study of the two case studies.
V  COMPARATIVE STUDY

A  Drivers

1  Overview

This section briefly compares and contrasts the drivers for addressing and governing infrastructure sustainability for the Sydney Metro Authority (SMA) and the Olympic Delivery Authority (transport division) (ODAT). The intention is to highlight that an approach to governing infrastructure sustainability is predicated on the existence of such drivers. And further, the sustainability advisers will need to be able to identify, understand and effectively communicate drivers to obtain project team participation in – and ownership of – infrastructure sustainability. The role of sustainability advisers in doing this is addressed in the framework in the next Part VI.

2  Legislative and Policy Drivers

For SMA, legislative and policy drivers included principles of sustainable development that are articulated in a number of statutes relating to the delivery of infrastructure projects. The principles have been discussed and debated in court cases, for example in relation to Drake-Brockman v Minister for Planning & Anor. Interviewee SS1 identified that costs associated with legal proceedings – where sustainable development principles are used to challenge planning decisions – were a significant driver for proponents to address infrastructure sustainability. For the Olympic Delivery Authority (corporate) (ODA) and ODAT, the Olympics Act provisions relating to sustainability have driven infrastructure sustainability and sustainability outcomes.

A key limitation with the legislative driver is that it could be considered unclear or intangible to a project team. This is especially true considering that intricacies associated with court

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746 See Part III Section A(2).
747 Ibid.
748 See Part IV Section A(3).
proceedings can be difficult to navigate, and also difficult to explain and relate back to the project team’s activities. Nonetheless, legislative-related risk should be considered in the identification of drivers, and further in the development of sustainability objectives and targets, especially for those issues that may be associated with legislative compliance measures in the future. Examples include requirements for measuring and reducing energy consumption and greenhouse gas (GHG) emissions.\textsuperscript{749}

At the policy level, the NSW Government Sustainability Policy requires public sector organisations to consider sustainability, as do policies pertaining to specific environmental or social issues that promote beyond legislative compliance activities such as the New South Wales (NSW) Aboriginal Participation in Construction Guidelines. These policies do, in some cases, support an infrastructure sustainability agenda, especially where the proponent is a government organisation that is required to comply with government-related policies.\textsuperscript{750}

3 Community and Stakeholders

Gaining public acceptability for the Sydney Metro project was a driver for action on infrastructure sustainability.\textsuperscript{751} A worst case scenario of being taken to court and losing public acceptability for the project promoted the adoption of an infrastructure sustainability agenda. Similarly, ODA and by default ODAT’s focus on legacy planning and outcomes has been driven in part by the media, the community and other stakeholders.

ODA and ODAT have a number of different stakeholders due to the sheer scale of the Games. Some key stakeholders such as the Greater London Authority have a clear sustainability agenda which has driven infrastructure sustainability within ODA and ODAT. ODAT has a number of transport delivery partners and operators who have specific ways of conducting activities on the rail network. However, ODAT is the main driver of infrastructure

\textsuperscript{749} At a global scale, there is increasing activity in the development of legislation and regulation aimed at reducing GHG emissions. See for example the Australian Commonwealth Government’s National Greenhouse and Energy Reporting Act 2008 enacted in preparation of a carbon trading system. There has been recent activity in Australia on carbon with the introduction of a carbon pricing mechanism (scheduled for 1 July 2012), details of which were announced on 17 July 2011 by the Government. See <www.cleanenergyfuture.gov.au/> at 12 July 2011.

\textsuperscript{750} See Part III Section A(2).

\textsuperscript{751} See Part III Section A(3).
sustainability on its projects, and is promoting infrastructure sustainability within these partner organisations.\textsuperscript{752}

4 Transformational Projects and Legacy

ODA’s focus on creating a transformational development overall, coupled with the commitment to legacy outcomes, has encouraged infrastructure sustainability on individual projects, such as on Orient Way. This is because long-term outcomes are generally at the forefront of decision-making, including for transport infrastructure projects.\textsuperscript{753} Similarly on the Sydney Metro project, the potential legacy value and transformational nature of the project was discussed,\textsuperscript{754} despite interviewees not specifically using the term ‘legacy’. Some SMA interviewees were of the view that the inherent sustainability associated with the provision of a new metro system needed to be maximised through the project delivery phase.\textsuperscript{755}

Both the Sydney Metro project and projects associated with the Games presented and present ample opportunity for infrastructure sustainability simply because of the sheer size, scale and investment associated with them. This combination of having the ‘spot-light’ on these projects because of their scale and influence, and the amount of funding associated with them, provides ample opportunity to push the boundaries of typical project delivery practices and move the benchmark of infrastructure sustainability forward. Where sustainability advisers are working on projects of a smaller scale, the drivers associated with scale and influence may not be as relevant.

5 Leadership-Level and Employee Appetite

In the case of SMA in particular, the idea of being part of a transformational project created an appetite for infrastructure sustainability in some employees. At the same time, the nature of the project very likely attracted individuals interested in sustainability outcomes at the early stages of mobilisation of the SMA.

\textsuperscript{752} See Part IV Section A(3). For example through the showcasing of new technologies, discussed in Part IV Section B(3).

\textsuperscript{753} See Part IV Section A(2).

\textsuperscript{754} See Part III Section A(4).

\textsuperscript{755} Ibid.
In the case of both ODAT and SMA, appetite for infrastructure sustainability and sustainability outcomes at the leadership-level appeared to be a significant driver. In both organisations, this included having the respective Chief Executive Officers (CEO) committed to and interested in infrastructure sustainability. For ODAT, this also includes having the commitment of the Head of Transport Systems and Games Safety, who as a senior employee responsible for the overall management approach, the Sustainability, Safety, Health, Environment and Quality Management System (SSHEQ), has key decision-making power. Scanlon and Davis also discuss the importance of obtaining leadership-level commitment to infrastructure sustainability, as do Scanlon and Hodgson in the context of urban rail infrastructure projects.

The extent of leadership-level appetite will differ from project to project, and this will affect the implementation of the framework presented in Part VI. Where there is limited appetite, the individuals responsible for implementing the framework should actively try to gain leadership-level commitment through a series of engagements. This relates closely to the roles and responsibilities Section 7 below. But even if leadership-level appetite and commitment exists, this should be nurtured throughout project delivery, especially since the existence of appetite does not necessarily mean that infrastructure sustainability and sustainability outcomes are being sought. And indeed ‘appetite’ and ‘commitment’ are intangible concepts that need to be considered and addressed on an individual-by-individual basis, as well as explored in the context of all work streams within a project.

6 Key Findings – Drivers for Infrastructure Sustainability

Where legislative provisions include sustainability-related principles, such as those relating to planning approval processes, they can be used to encourage infrastructure sustainability within a project team. This is also relevant for policies, particularly where the proponent is a government organisation. Legislative and policy drivers should therefore be identified as part of an approach to governing infrastructure sustainability.

756 Scanlon and Davis, above n 402, 126-127.
757 Scanlon and Hodgson, above n 46, 49.
Obtaining community and other stakeholder acceptance for a project, in addition to existing stakeholder sustainability agendas, will also be key drivers to be considered in an approach to governing infrastructure sustainability. Further, the nature of a project as transformational or ‘inherently’ sustainable can be used to encourage infrastructure sustainability. Where a project is both in the ‘spotlight’ and has ample funding, this provides a good opportunity to move the benchmark of infrastructure sustainability forward.

Finally, leadership-level appetite and commitment is a significant driver of infrastructure sustainability and sustainability outcomes. An approach to governing infrastructure sustainability should nurture existing appetite and commitment, or promote it where it does not already exist. This should be undertaken across all disciplines and work streams where possible.

B Approaches to Governing Infrastructure Sustainability

1 Overview

This section compares and contrasts the case study approaches to governing infrastructure sustainability. By examining the approaches comparatively, it is possible to consider how components in one approach challenge, support, inform, or add value to components in another. This is particularly important for components that relate to later stages of project delivery where lessons can be taken from the ODAT case study rather than SMA, due to the time of project delivery when the Sydney Metro project was deferred.

The comparative study also enables an understanding of how challenges presented in one case study could be overcome by a particular process in another. Theory concerning the most appropriate way to govern infrastructure sustainability is developed based on this analysis. This theory forms the basis of the framework for governing infrastructure sustainability in Part VI. Hence, the end of each section provides a brief summary of key findings and recommendations applicable to the framework.
2 Overall Structures

(a) Overview

This section compares and contrasts SMA and ODAT’s overall structures for governing infrastructure sustainability. It discusses the benefits associated with certification of an approach; the importance of an approach being embedded and documented; adapting sustainability objectives and targets that may be ‘inherited’ from another organisation; ideal principles and themes to underpin an approach; the need for a strong policy base; and finally the importance of actioning an approach. Key findings are then summarised.

(b) The Utility of British Standard 8901

Both SMA and ODAT had an overarching management framework for governing infrastructure sustainability. SMA had its Sustainability Management Framework and ODAT has its Sustainability Management System (SuMS). These frameworks both formed or form the foundation for infrastructure sustainability and sustainability outcomes. To varying extents, both are underpinned by management system principles and processes as per Figure 7 found in Part IV, including commitment and policy.

ODAT developed its SuMS based on British Standard (BS) 8901 which requires organisations to understand the sustainability issues relevant to all aspects of their event – including infrastructure delivery, operation and decommissioning – and to put in place measures to control and minimise impacts. SuMS has a focus on corrective and compliance actions to conform with BS 8901 requirements – with good ‘checks and balances’, especially with the inclusion of external auditing.

Although SMA’s Sustainability Management Framework was not based on any standard, its key components reflected typical management system processes and principles, for example a mechanism for continuous improvement. Further, interviewee SL2 indicated that a mechanism for tracking and checking progress made toward meeting sustainability objectives

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758 See Part IV Section B(2).
759 See Part IV, Section B(11).
760 See Figure 7 in Part III Section B(2).
and targets was to be developed. However, how such mechanisms would have worked in practice cannot be known given the Sydney Metro project was deferred before they could be developed and implemented. Certainly, any approach to governing infrastructure sustainability should be based on sound, proven management system processes and principles.

Despite the apparent success associated with using BS 8901 as the basis for an infrastructure sustainability governance approach, it is important to acknowledge that such a standard is not in itself capable of achieving sustainability outcomes. BS 8901 provides the outline and guidance on how to develop and implement an approach. However, it does not set out what sustainability objectives or targets should be developed. Hence, BS 8901 is not prescriptive, which is appropriate given each event (and infrastructure project) will differ. Further, both case studies reveal important issues not covered by BS 8901, including how to overcome various challenges that can arise during project delivery, including for example by engaging sustainability advisers with the right set of qualities and attributes (as per Section 7 below) to challenge conservative attitudes. Further, BS 8901 does not provide guidance on how to interface and integrate with other project delivery processes including procurement, design, and planning which – as demonstrated in both case studies – is critical.

However, it would not be appropriate for BS 8901 to discuss such challenges and constraints and how they can be overcome, or the interface between an approach and other project delivery processes. This is because as stated above, BS 8901 has broader application to events, not just infrastructure project delivery, let alone urban rail infrastructure project delivery. Further, the key focus of management system standards is to avoid being prescriptive, as expressed by Peter Boswell from the International Federation for Consulting Engineers (FIDIC). The discussion of challenges, and the framework in Part VI’s focus on overcoming various challenges likely to arise in an urban rail infrastructure project context is of particular importance and provides additional value. Using BS 8901 would form just one piece of the puzzle – including in how it can contribute through the certification process as discussed below.

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761 See Part III Section B(11).
762 See Part IV Section B(2).
(c) Embedding and Documenting an Approach

Having a structured and documented approach in place gives ‘gravitas’ to infrastructure sustainability and sends a message to the project team – and external stakeholders where it is communicated externally – that it is as important as other systems and processes such as an EMS, health and safety or communications system. However, the approach must be integrated with these other systems and processes.

ODAT’s SuMS, for example, is integrated into its SSHEQ, and is therefore in theory given equal standing to these other processes. It is not as clear where SMA’s Sustainability Management Framework sat in terms of other systems such as health and safety. However, it was intended to bring together existing infrastructure sustainability activities being undertaken by the PBACH sustainability advisers.\textsuperscript{763} Such activities formed part of design, planning, and procurement processes and activities. Therefore the Sustainability Management Framework provided a structured approach to managing these infrastructure sustainability interfaces. However, in light of ODAT’s firm integration of its SuMS, SMA’s approach could have benefited from being further integrated with other systems. For example, it could have formed part of an integrated sustainability, environmental, quality, and health and safety management system.

Having an approach integrated with other systems does not mean it should be absorbed into those systems, for example into an EMS. This is because there is the danger of it losing its holistic representation of sustainability, and in the case of an EMS, it being perceived by stakeholders as purely an environmental management process.\textsuperscript{764} On the other hand, there must be interfaces between the approach and other systems such as on stakeholder management, because infrastructure sustainability is a holistic concept, covering an array of social, economic and environmental issues.\textsuperscript{765} In the case of SMA, this interface happened more organically, in that the sustainability advisers interacted with the different disciplines and work stream activities. For ODAT, the interfaces were purposeful and planned.

\textsuperscript{763} See Part III Section B(2).
\textsuperscript{764} See Part I Section A for discussion on other constraints associated with adapting an EMS to include social and economic issues.
\textsuperscript{765} As discussed in Part I Section A.
spearheaded by the Head of Transport Safety and Games systems and facilitated by the SuMS as part of the integrated SSHEQ.

(d) Certifying an Approach

It is possible that having an approach such as ODAT’s SuMS linked to a Standard makes it more ‘sellable’ to the project team. Because it is a recognised certification, its importance can be portrayed to those apprehensive about infrastructure sustainability or unconvinced of its tangibility, especially those project employees with a compliance focus. An added benefit is that it sends a message to external stakeholders that it is a robust framework because it has been certified by a renowned organisation like the British Standards Institute.

Such benefits can also accrue from being ‘certified’ or rated under a scheme like CEEQUAL, an assessment and awards scheme for improving sustainability in infrastructure projects, or the Australian Green Infrastructure Council (AGIC)’s sustainability-rating scheme. However, in the case of CEEQUAL – as discussed in Part IV Section B(9) – the requirements to be met to achieve high scores within the Project Management Section are limited. It is suggested that the Project Management Section of CEEQUAL as it currently stands cannot provide adequate assurance that a governance approach is indeed robust and effective – although the achievement of outstanding performance across other themes and categories could be evidence in itself that the governance approach was effective. Other issues associated with CEEQUAL are discussed further in Section 8 below.

(e) Adapting ‘Inherited’ Sustainability Objectives and Targets

Another point of difference is the relationship between ODA and ODAT, and SMA. SMA was rather removed from any existing organisational policy arrangements, being a new organisation set up to deliver the metro system.\textsuperscript{766} ODAT has a shared Policy and Plan on sustainability, including with ODA and LOCOG, together forming the London 2012 team. ODAT therefore effectively inherited the themes and high-level principles for example from the London 2012 Sustainability Plan. However, because there is such a strong focus on sustainability for the Games overall, this shared focus has not been a hindrance but rather

\textsuperscript{766} See Part II Section B.
enabled ODAT to adopt a strong infrastructure sustainability mantra and subsequent governance approach for activating that mantra. Of importance is that ODAT prioritised the London 2012 sustainability themes and developed specific initiatives to suit the context of its transport project program.  

(f) Ideal Principles and Themes

One Planet Living principles\(^{768}\) and other holistic sustainability principles can be used as they were for the Games.\(^{769}\) However, as interviewee OS2 observed, they don’t actually provide much guidance on implementation. Further, there is limited variation across the different sets of sustainability principles – and importantly the different sustainability themes – presented in different approaches.\(^{770}\) This is because as interviewee SS1 suggested, ‘there are only so many ways you can cut sustainability’. The main advantage of using principles such as those provided by One Planet Living is that they are an established set of principles that some stakeholders may identify with and/or understand.

As identified in Part I Section A(2), it is appropriate to view the infrastructure sustainability concept through seven themes in the context of the delivery phase of an urban rail infrastructure project. The use of these themes is supported by the ODAT and SMA case studies, and by a review of approaches used in the literature such as of Koo et al and Fernández-Sánchez and Rodríguez-López.\(^{771}\) These themes are adopted as part of the framework for governing infrastructure presented in the next part. These themes also take into account those used in existing sustainability assessment rating tools – namely CEEQUAL and AGIC. Again, these themes are:

9. Resource use – responsible material selection and use.
10. Emissions – manage GHG emissions, and discharges to air, water and land.
11. Biodiversity – enable functioning ecosystems, and enhance biodiversity.

\(^{767}\) See Section 3 below.
\(^{768}\) See Part IV Section B(2).
\(^{769}\) Ibid.
\(^{770}\) Ibid.

\(^{771}\) See Part I Section A.
\(^{771}\) See above footnotes 16 and 60 respectively.
12. Infrastructure resilience – consider whole-of-life implications, and adapt to potential climate change impacts.
13. Socio-economic – enhance living conditions and promote economic opportunities.
14. People and place – promote safety, health and well-being of internal and external stakeholders both now and into the future.

As discussed in the SMA case study, including the approach to governing infrastructure sustainability as a theme in itself (namely project management and governance) is necessary. This is because it reinforces to internal and external stakeholders that it underpins infrastructure sustainability and the achievement of sustainability outcomes. Further, its importance in achieving desired outcomes across the other themes needs to be clearly articulated, including by ensuring it appears as the first theme in associated documentation.

(g) The Need for a Strong Policy Base

Both case studies reveal that having a strong sustainability policy base, including developing strong policy positions on individual themes, is imperative. In this instance, ‘strong’ means that the policy is clearly defined and is given impetus. ODAT has the London 2012 Sustainability Policy and London 2012 Sustainability Plan which sets out the overall commitment to sustainability. SMA had a policy which articulated the ten sustainability themes. Both policies were signed off at the leadership-level for example by the CEO. This gives considerable clout to the policies and overall approaches, and to infrastructure sustainability, because each policy has the ‘green light’ and commitment from key decision-makers who wield significant influence and power in the organisation. It becomes even stronger when the policy is well articulated, for example has all the themes laid out with sustainability objectives attached. Sustainability advisers can point to the policy when project employees are being reluctant to adopt infrastructure sustainability thinking, and demonstrate that it is a project commitment and that they must abide by it. In this way, the policy becomes a support tool and is the ‘backbone’ to the approach to governing infrastructure sustainability.

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772 See Part IV Section B(2).
(h) Actioning an Approach

A final observation with respect to the overall structures for governing infrastructure sustainability is that having an approach will not in itself guarantee infrastructure sustainability and sustainability outcomes. It needs to be ‘actioned’ to be effective and to ensure it is not ‘shelved’. In particular, an approach would likely be ‘shelved’ if it is not effectively embedded and integrated into other project delivery processes, as per above. There are many activities and issues to be considered in actioning an approach, as discussed in the following sections.

(i) Key Findings – Overall Structures

Key findings in terms of the overall structure of the case study approaches to governing infrastructure sustainability include that if an organisation is ‘inheriting’ sustainability themes and high-level principles, these should be prioritised and initiatives developed that suit the project-specifics. Further, it is important to have a structured and clearly articulated approach for governing infrastructure sustainability that is embedded and integrated with other project delivery systems and processes; and it will be advantageous to seek certification of an approach to governing infrastructure sustainability, provided that such certification is meaningful.

Other findings include that there are only so many ways to break down the infrastructure sustainability concept so that it can be operationalised. For the purposes of the framework in Part VI, eight themes have been developed. A sustainability policy that is signed off at the leadership-level is the ‘backbone’ of an approach to governing infrastructure sustainability. Further, ‘actioning’ an approach is critical. Effectively applying all of the framework components presented in Part VI will help ensure this.

3 Sustainability Objectives, Targets and Initiatives

(a) Overview

This section compares and contrasts SMA and ODAT’s sustainability objectives, targets and initiatives. It discusses the validity of excluding purely economic objectives from an approach; the need for prioritisation of sustainability objectives and targets; and the different
approaches to developing and setting sustainability objectives, targets and initiatives (although this is also discussed in Section 6 below on procurement). Key findings are then summarised as relevant to the framework for governing infrastructure sustainability.

(b) The Validity of Excluding Economic Objectives

For both case study organisations, the themes and associated sustainability objectives were similar. They both addressed social and environmental dimensions of infrastructure sustainability. For example, both included objectives relating to reductions in water use and carbon emissions, and promoting community health and well-being.\textsuperscript{773} They are both consistent with the general approach to separating sustainability issues across various environmental and social or socio-economic themes, as found in some academic studies and in many industry approaches,\textsuperscript{774} and as discussed in the preceding section.

It may appear that there is a gap in relation to the break-down of the case study sustainability objectives and the definition of infrastructure sustainability presented in Part I of this thesis. The definition discusses the importance of addressing economic dimensions; and looking at interactions and trade-offs across environmental, social and economic dimensions. Yet in both case studies, the economic dimension is not a focus within the sustainability objectives. However, the economic dimension was inherently addressed through cost benefit and other feasibility studies of specific initiatives under each objective, particularly in the SMA case study. Further, economic objectives are traditionally found in a project’s overall vision, values and objectives, for example relating to delivering on-time and on-budget. Because economic feasibility assessments are intrinsic to the exploration of sustainability initiatives, and further because having a focus on economic imperatives alone is undesirable, it is argued that having a specific theme on economic performance is unwarranted.

Interestingly, AGIC’s rating tool proposes to include economic objectives in its assessment criteria.\textsuperscript{775} However this can be criticised because it could lead to economic considerations again taking precedent. Similar criticism has been made of bringing economic considerations

\textsuperscript{773} See Tables 2 and 3 in Parts III and IV respectively.
\textsuperscript{774} See Part I Section A.
\textsuperscript{775} See the Australian Green Infrastructure Council, above n 60.
into strategic environmental and sustainability assessment processes.\textsuperscript{776} It is better that sustainability performance assessment and rating tools focus on environmental and social issues, while including in project management and governance-related themes the requirement for robust economic feasibility studies for proposed initiatives. This is discussed further in Section 10 below.

Economic feasibility assessments form a critical part of the project development phase of an infrastructure facility or project – namely in the development of the business case for obtaining funding through Treasury or equivalent. And while there is some debate as to the accuracy and reliability of typical economic assessments, including cost benefit studies associated with the business case for a proposed project,\textsuperscript{777} this stage of the delivery phase is beyond the scope of this thesis and – more specifically – beyond the boundaries of the case studies as outlined in Part II Section A(3). Economic feasibility in this sense relates more to the notion of ‘sustainable’ infrastructure than infrastructure sustainability.\textsuperscript{778}

(c) The Need for Prioritisation

A finding from both case studies is that prioritising various themes, objectives, targets or initiatives based on a number of factors is important. As discussed above, ODAT prioritised the sustainability themes it inherited from the London 2012 Sustainability Policy and Plan to suit the specifics of its transport project program. SMA undertook prioritisation more organically. As discussed in Part III Section B(10), business cases and technical studies were undertaken for targets and initiatives that would have the greatest sustainability benefit to get leadership-level ‘buy-in’. Buy-in was not always achieved because – as was the case with tri-generation on the Sydney Metro project – some initiatives were perceived to be too risky.\textsuperscript{779} This prioritisation was also enabled through the Sustainability Initiatives Register (SIR) as designers and the PBACH sustainability advisers could determine what initiatives were feasible, and cull others that were not, which influenced targets set for the different sustainability themes and objectives. An outcome of this prioritisation process for SMA was

\textsuperscript{776} See Riki Thérivel, Pietro Caratti, Maria do Rosário Partidário, Ásdís Hlökk Theodórsdóttir and David Tyllesley, ‘Writing Strategic Environmental Assessment Guidance’ (2004) 22(4) Impact Assessment and Project Appraisal 259, 266; and Pope et al, above n 73, 597, respectively.
\textsuperscript{777} See in general Flyvbjerg, above n 324.
\textsuperscript{778} See Part I Section A and footnote n 6 and accompanying text.
\textsuperscript{779} See Part III Section B(4).
the policy commitment to offset 100 per cent of operational GHG emissions through the purchasing of renewable energy.  

Prioritisation is therefore an important activity in both approaches, and is starting to appear in the literature as an effective way of addressing infrastructure sustainability. In their sustainability assessment performance tool for example, Fernández-Sánchez and Rodríguez-López propose prioritisation methods to dismiss opportunities that are not viable and to better select opportunities which reflect the most important aspects of sustainability for the project in question.  

Scanlon and Davis also outline the importance of prioritisation methods using an urban rail project example from the Gold Coast in Australia where a prioritisation process was applied. Further, Hill and Bowen discuss how interested parties to a project should decide on the extent to which various sustainability objectives are addressed.

The benefits of prioritisation include utilising resources effectively by concentrating on a few key areas, as opposed to a ‘shopping list’ approach where only limited outcomes across many themes would be possible. As such, one method of prioritisation is integrated into the framework presented in Part VI. However, other tools or methods including some form of multi-criteria decision analysis or risk assessment may be appropriate in facilitating prioritisation. An analysis of the role of such tools and methods in this context is beyond the scope of this thesis. However, it should be considered in future research efforts.

The project management and governance theme as provided in Section 2 above should be outside of the scope of prioritisation. This is because – as outlined in Part I Section A – it forms the basis through which beneficial outcomes across the other themes can be realised. Further, this theme is about process, as opposed to an impact or opportunity area.

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780 See Part III Section B(3).
781 Fernández-Sánchez and Rodríguez-López, above n 60, 1196.
782 Scanlon and Davis, above n 402, 129.
783 Hill and Bowen, above n 30, 227.
784 Scanlon and Davis, above n 402, 129.
785 See for example the Australia/New Zealand Standard AS/NZS 4360:1999 on risk management. Interestingly, Fernández-Sánchez and Rodríguez-López (above n 60) use risk assessment methods in their method for prioritising sustainability issues.
(d) Engaging with Internal and External Stakeholder to Develop Sustainability Objectives and Targets

In both cases, sustainability objectives, targets and initiatives were developed based on consultation with internal and external stakeholders. For example, initial targets and initiatives for SMA were developed by PBACH sustainability advisers in consultation with the design team. ODAT’s internal testing of its targets and initiatives included with the ODA Director of Construction Delivery. In terms of external stakeholders, SMA used procurement processes to ensure the viability of the sustainability targets and initiatives by asking the bidding consortia to provide their own sustainability targets and initiatives, requesting they provide evidence that they could be achieved. By default to ODA’s activities, ODAT tested many sustainability objectives and targets in the market through active engagement with industry, including via industry forums.

Hence, ODAT was more active in consulting externally in terms of these industry forums than SMA, and in preparing industry for its sustainability requirements in the process. SMA could have, for example, used existing forums through which to test its sustainability objectives, targets and initiatives such as in forums facilitated by Infrastructure Partnerships Australia. Presently, AGIC’s Knowledge Hub also provides a good forum. However, a SMA interviewee did acknowledge that:

“It is important to work with industry because at the end of the day, industry knows what is achievable. Industry knows what is best practice, and where you really can get your wins. I do think it is a bit of tacking between the two. You really do need to bring in the expertise of industry. You could be aiming high, but sometimes it is just not viable.”

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787 See Part III Section B(6).
788 See Part IV Section B(6).
789 Ibid
790 Infrastructure Partnerships Australia is an infrastructure industry association. It has a Sustainability Taskforce that includes representatives from various member organisations from construction contractors, design consultancies and proponent organisations to investors. The Taskforce meets regularly to discuss and address key sustainability issues for the industry.
791 The Knowledge Hub is a section on AGIC’s website that includes information resources such as project sheets, presentations, articles and conference proceedings, separated under the various themes. See <www.agic-khub.net.au/knowledge-hub/> at 2 March 2011.
792 Interviewee SD2.
The focus on consulting externally is therefore a good lesson to take from ODA and ODAT and forms part of the framework presented in the next part. However, both internal and external consultation on sustainability objectives, targets and initiatives can be viewed as critically important.

(e) Key Findings – Sustainability Objectives, Targets and Initiatives

Key findings in relation to sustainability objectives, targets and initiatives include that an approach should focus on developing and achieving social and environmental objectives. Economic objectives should be inherent in the approach, but should not be made explicit so as to retain adequate focus on achieving good social and environmental outcomes. Further, sustainability objectives, targets and initiatives should be focused through a prioritisation process that enables opportunities to be maximised and resources to be targeted.

SMA’s initiatives were largely conceptual as the project did not go ahead. In the case of ODAT, initiatives to achieve the sustainability objectives and targets were actually undertaken ‘on the ground’. Investigating the challenges of implementing these initiatives and how these were overcome therefore helps fill the gap presented by the SMA case study. An analysis of these challenges and how they were overcome in the context of the ODAT case study is provided in subsequent sections.

4 Design Processes and Infrastructure Sustainability

(a) Overview

This section compares and contrasts how the design processes within SMA and ODAT interfaced with the approach to governing infrastructure sustainability, and more specifically how these processes interfaced with the sustainability objectives, targets and initiatives. Further, it explores the challenges faced in integrating infrastructure sustainability and design processes by both ODAT and SMA. Specifically, it discusses the importance of linking an approach with early design stages; building capacity and accountability in design-related decision-making; and understanding the ‘true’ sustainability of an initiative. Following this analysis, key findings are presented for how to effectively integrate sustainability objectives, targets and initiatives with design processes in order to optimise an approach to governing infrastructure sustainability. This informs the framework presented in the next part.
Part V Section B

(b) Linking Approach with Early Design Stages

A key finding from the SMA case study is that infrastructure sustainability needs to be integrated with design processes as early as possible. The PBACH advisers were involved early, and informed the development of the SIR through exploring and testing different design initiatives that would achieve sustainability outcomes. Moreover, it appears that in the case of SMA, these early design processes helped to shape the sustainability objectives, targets and initiatives that were then articulated into the planning approvals and procurement processes.

However for ODAT, many of the sustainability objectives and targets have been inherited and then adapted from ODA or the broader London 2012 sustainability agenda. These sustainability objectives and targets therefore have to effectively be retrofitted into specific urban rail projects such as West Ham. The key difference is that the Sydney Metro was a new system altogether, whereas ODAT is delivering a number of smaller projects across various sites, and these projects are just one aspect of a massive collection of Games-related infrastructure to be delivered. So despite how early ODAT interfaces infrastructure sustainability with design processes, the project team is still required to conform with existing sustainability objectives and targets. However, ODAT still has discretion in the selection of specific design or other initiatives to reach those objectives and targets.

It is important to consider when creating an interface between early design stages and an approach to governing infrastructure sustainability that not a lot is known about the project at these early stages, and as a consequence specific targets and initiatives might be difficult to define. However, this does not prevent ‘big ticket’ items that do not depend on exact design details – such as 100 per cent renewable energy target for operations as was being proposed for the Sydney Metro project – from being researched and locked in. This is discussed further below in the context of proponents determining the key sustainability objectives and targets that they are not willing to compromise and translating them into procurement processes.

(c) Building Capacity and Accountability in Design-Related Decision-Making

One of the key lessons from ODAT, and in particular the West Ham project, was that there will typically be design constraints that in some cases might outweigh any sustainability
objectives, targets or desired initiatives. Such constraints might include a tight project program or budget, or physical complexities that restrict design solutions. The ODAT experience also demonstrates that the presence of design constraints places significant decision-making power in the hands of individual design managers and project managers, and that such decision makers need to find a balance between all decision-making factors.

Similar challenges were revealed for the SMA case study. Interviewee SD2 discussed how projects are typically difficult to deliver, so any additional requirements relating to sustainability might compromise the project program. This could be addressed by ensuring that design briefs for the very front-end design work – for example those that went to the PBACH design team initially – are clearly linked to the proponent’s sustainability policy, including any sustainability objectives and targets (assuming they have been developed at that point). Further, design briefs should require adequate sustainability resources so that tenderers can cost and receive budget for infrastructure sustainability activities accordingly. This will also help ensure adequate time can be spent on undertaking benchmarking, feasibility studies and other decision-support activities.

Proponents should integrate infrastructure sustainability thinking into early stages of project delivery, and even into the project development phase (see Figure 1). During project development, and further into planning and feasibility, project funding and resourcing is being determined and therefore infrastructure sustainability activities (which at this stage would be necessarily conceptual) can form part of the cost profile of a project. As discussed, the link between the case study approaches and the project development phase, namely pre-feasibility and concept where the overall business case for the project is being developed, is outside the scope of the case study analyses. However, further exploration of these connections is warranted, as discussed in Part VII.

Other key challenges to implementing innovation design solutions for sustainability outcomes included a lack of leadership-level appetite, mainly for those initiatives considered ‘too

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793 See Part IV Section B(4).
794 Ibid.
795 See Part III Section B(4).
796 And in the case of SMA, time constraints were viewed as a challenge for some design consultants. See Part III Section B(4).
risky’. Some leadership-level employees also wanted to go for initiatives that were deemed easy ‘wins’, but would not necessarily achieve the best sustainability outcome. A degree of capacity building of the leadership team then had to take place, namely through providing clear business cases and feasibility reports. The sustainability advisers building relationships with the leadership team was also an important enabler. Finally and perhaps most importantly, prioritising the important initiatives so as to ‘win the big ones’ ensured that resources and efforts could be placed in getting the important initiatives ‘over the line’. The prioritisation of specific initiatives – as opposed to broader themes or objectives – can be undertaken in line with the prioritisation tools and methods discussed above.

The need to educate and build the skills of design decision-makers on infrastructure sustainability is imperative, and clear links should be made between design processes, strategies for capacity building and decision-support tools. Further, checking and corrective actions such as through design employee key performance indicators will help ensure decision makers are held accountable. The SMA case study provides a useful touch stone here in that weekly sustainability meetings were held where possible sustainability design initiatives were explored. These meetings included the Environmental Sustainability Manager and PBACH sustainability advisers who would have been able to capacity build the broader design team, despite that there was no formal training and development program in place at the time of the project’s deferment.

Further, the SIR allowed the implementation of sustainability targets and initiatives to be tracked which provided accountability in the process. And should the Sydney Metro project have gone ahead, the SIR would have been used to ensure that later stages of design such as detailed design and the development of construction specifications did not result in any sustainability targets or initiatives (as committed to by the PRI and IMO contractors through the procurement process) being excluded or ‘scoped out’. Of course there may be circumstances where excluding initiatives prior to the construction stage is necessary due to,

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797 See Part III Section B(4).
798 See Part III Section B(4).
799 See Section 9 below.
800 See Part III Section B(12).
801 As discussed as an issue in Part III Section B(4). See also Section 4 below.
for example, constructability issues. This makes early contractor involvement critical, and such involvement is typically facilitated through delivery methods such as design and construct, and relationships-based contracts as discussed in Section 6 below.

The tracking of early design stage initiatives through to later design stages should not mean that specific initiatives should be inflexible and non-adaptive. On the contrary, building flexibility into early design stage initiatives is imperative so they can be adapted at later stages should constructability or other such issues arise, or if technological or other factors result in the need or desire for change as the project progresses. The tracking process should enable identification of which sustainability targets and initiatives require updating to ensure continuous improvement is being achieved.

(d) Understanding the ‘True’ Sustainability of an Initiative

The ODAT case in particular highlights that it is necessary to gain adequate information about the ‘true’ sustainability of an initiative. Interviewee OEn1 discussed this issue in the context of the West Ham project and whether to use timber or steel handrails. Undertaking adequate research into an initiative is therefore important, and decision-support tools such as life-cycle assessment (LCA) should be applied where appropriate. This issue was not explicitly discussed in the SMA case study, possibly because the project did not reach detailed design and construction stages where possible issues would have become apparent. However, some of the research undertaken as part of the suite of decision-support tools used would have revealed important environmental, social and economic benefits and disadvantages associated with various initiatives.

This challenge of understanding the true sustainability of an initiative links with the concept of trade-offs. Trade-offs were defined in Part I Section A. Clearly, unless there is a adequate knowledge and understanding about the true impacts of an activity or initiative, the ability to make informed decisions can be significantly constrained. Having the resources to undertake research, including by benchmarking operational projects where an initiative has been implemented and impacts are reasonably transparent, forms a step on the critical path to
understanding initiatives and making informed decisions about acceptable trade-offs. It is also important to test assumptions and challenge preconceptions about environmental (and social and economic) performance, largely because the ‘knowledge base is unstable’. But, as discussed in Part IV Section B(9), where there is insufficient information to be gained about the impacts, benefits or disadvantages of an initiative, it is prudent to adopt a precautionary approach.

(e) Key Findings – Design Processes and Infrastructure Sustainability

Key findings in relation to design processes and infrastructure sustainability include that if a project organisation has inherited specific sustainability objectives and targets, this will impact on design-related infrastructure sustainability activities. However in all circumstances, there is a need to integrate the approach to governing infrastructure sustainability with design processes as early as possible.

Design constraints are a project reality and they may affect the implementation of infrastructure sustainability design initiatives. Capacity building the design team and key design decision-makers is imperative, as is creating accountability and transparency by – for example – linking infrastructure sustainability with employee key performance indicators. Capacity building the leadership-level is also critical, especially in achieving the important and high priority sustainability objectives, targets or initiatives. Creating a SIR that keeps track of the implementation of design initiatives should be a key feature of an approach to governing infrastructure sustainability.

Finally, resources should be assigned to exploring the ‘true’ sustainability of an initiative prior to specifying it in design stages. At the same time, preconceptions about the performance of an initiative need to be challenged, predominately because the knowledge base is typically unstable.

See footnote 626 and accompanying text.
5 Planning Approval Processes and Infrastructure Sustainability

(a) Overview

This section compares and contrasts how the planning approval processes within SMA and ODAT interfaced with the approach to governing infrastructure sustainability, and more specifically how these processes interfaced with the sustainability objectives, targets and initiatives. Further, it explores the challenges faced in integrating infrastructure sustainability and planning processes by both ODAT and SMA. However, the analysis is primarily based on the SMA case study and ODA, because as discussed in Part II Section A(5), there was limited data on planning approval processes for ODAT. Following this analysis, key findings for how to effectively integrate sustainability objectives, targets and initiatives with planning approval processes are presented and inform the framework in the next part.

(b) Linking Sustainability Objectives, Targets and Initiatives to Planning Conditions

In the case of both SMA and ODA, provisions in the related planning approval processes were used to give impetus to various sustainability objectives, targets and initiatives. Of importance is that ODA actually has operational approval conditions which are being actively used to motivate delivery partners to adopt infrastructure sustainability and reach sustainability targets.806 This was the intention of SMA, where draft Statement of Commitments (SoCs) in the CBD Metro environmental assessment report reflected some of the sustainability objectives, targets and initiatives developed by SMA.807 These SoCs would likely have been translated into conditions of consent, which as discussed in Part III Section B(5), would have meant that many of the sustainability objectives, targets and initiatives would have been effectively ‘enshrined in law’.808

There is then a need to clearly articulate the linkages between the embedment of sustainability objectives, targets and initiatives and planning approval processes, and the overall approach to governing infrastructure sustainability. This is highlighted in the case of ODA where some indicators used to track progress toward targets were intentionally

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806 See Part IV Section B(5).
807 See Part III Section B(5).
808 Ibid.
connected to conditions of consent. Such indicators form an important part of the overall approach to governing infrastructure sustainability. Therefore, such linkages and interconnectivity between planning approval processes and infrastructure sustainability are important and need to be clearly ‘mapped out’. This ‘mapping out’ could be achieved for example through ensuring the SIR or equivalent highlights where targets and indicators are connected to certain conditions of consent or approval. Alternatively, it could sit as a separate table as part of the overall documentation of the approach. The importance of ‘mapping out’ the organisational structure, project delivery processes and timeframes more broadly was discussed in the SMA case study,\textsuperscript{809} and this is addressed in the framework in Part VI.

When seeking to use provisions in a planning approval process, it is important to understand limitations that might be inherent in the planning system in question. As highlighted in the SMA case study, some enforcement mechanisms may be weak, reducing the robustness and meaningfulness of both the approval condition and attaching a sustainability target to it.\textsuperscript{810}

In some circumstances, it will be unfavourable to be too specific in how a sustainability target or initiative is articulated, for example in NSW when defining a SoC to be placed in a condition of consent.\textsuperscript{811} This is because, as discussed above, it may be undesirable to lock in a technology that might become redundant or unfeasible at the construction stage. This is where early contractor involvement to ensure constructability or buildability, discussed further in Section 4 below, becomes critical. On the other hand, any ambiguities in how a sustainability target or initiative is articulated would be unfavourable because it may be difficult to actually monitor and audit and hence enforce ‘on the ground’. Hence, there is a need to find a balance between being prescriptive and allowing flexibility when articulating and negotiating any conditions of consent that are linked to sustainability objectives, targets and initiatives.

\textsuperscript{809} See Part III Section B(7).
\textsuperscript{810} See Part III Section B(8).
\textsuperscript{811} However, in ODA’s case, the sustainability advisers did not appear to influence how the planning conditions were articulated in terms of sustainability objectives, targets and initiatives, but rather worked with the final planning conditions. See Part IV Section B(5).
Part V Section B

Another consideration in using planning approval processes to achieve sustainability outcomes is that the specifics of the project are largely unknown at this stage. For example for the Sydney Metro project, there was a reference design but little more. This issue is also discussed in Section 4 above in the context of developing specific initiatives at early design stages, as well in Section 6 below in the context of interfacing sustainability objectives, targets and initiatives with procurement processes.

A final consideration not raised in either case study but which is of importance is the opportunity for impact assessment processes, including for example environmental and social, to help inform the development and implementation of an approach to governing infrastructure sustainability. Criteria defined and used during environmental impact assessment can be used in developing EMS; and environmental impact assessment findings can provide good baseline information against which the success of environmental management activities can be examined. Such findings are translatable to the context of an infrastructure sustainability governance approach. For example, sustainability objectives, targets and initiatives can be informed by impact assessment outcomes, including based on community and other stakeholder feedback during the impact assessment process. At the same time, as discussed above, the sustainability objectives, targets and initiatives and other aspects of an approach to governing infrastructure sustainability can inform impact assessment activities, including what forms part of the conditions of consent.

(c) Key Findings – Planning Approval Processes and Infrastructure Sustainability

It is important to integrate known sustainability objectives, targets and initiatives into the planning approval process because they then become a matter of compliance – providing a forceful driver or ‘stick’ to encourage implementation. This is of course dependent on the rigour of and enforcement provisions in the planning approval process in question. Other opportunities in how the development of sustainability objectives, targets and initiatives can inform and in turn be informed by impact assessment activities should also be considered.

812 See Part III Section B(8).
813 See Part III Section B(4).
814 Palframan, above n 110, 1.
6 Procurement and Infrastructure Sustainability

(a) Overview
The articulation of sustainability requirements into procurement, including request for proposal (RFP) and subsequent contract, documentation and the selection of tenderers based on sustainability considerations was found to be of critical importance in both case studies. There was some variation in how this was undertaken, and this section goes into a detailed comparison to draw conclusions about the most appropriate way to use procurement processes to achieve infrastructure sustainability and sustainability outcomes.

The challenges faced by SMA and ODAT in the context of procurement and infrastructure sustainability is also discussed in this section, specifically: the importance of committing to infrastructure sustainability in procurement; the influence of delivery method and contract type of infrastructure sustainability and sustainability outcomes; the need to understand the delivery method when developing sustainability requirements; and the need to test and trust the ‘market’ and be relatively non-prescriptive. Further, the importance of understanding that sustainability assessment rating tools are complementary but not an approach in themselves; the important role of sustainability advisers in the articulation of sustainability requirements; accounting for the speed of project delivery processes; and finally, how to undertake proposal and tenderer evaluation in terms of infrastructure sustainability, is discussed. Based on this analysis, important lessons are applied to the framework found in the next part.

(b) Committing to Infrastructure Sustainability in Procurement
Both SMA and ODAT were extremely active in integrating the respective infrastructure sustainability commitments – including specific objectives, targets and initiatives – into procurement processes. At the ODA level, the concept of sustainable procurement was articulated into various sustainability policy documents, including the main Procurement Policy, where sustainability was considered to be a core component of procurement activities. ODAT viewed the need to compel contractors to adopt infrastructure sustainability through procurement mechanisms as ‘critically important’, and its commitment

815 See Part IV Section B(6).
to implementing this mantra is demonstrated through the sustainability requirements as discussed below.

In the case of SMA, the commitment to embedding sustainability in procurement processes is clear not only in the extent of the sustainability requirements, but also in the suggestion by several interviewees that SMA is considered to have undertaken leading practice in this area. However, SMA did not appear to have a sustainable procurement policy at the time the project was deferred, or articulate sustainability into its main procurement policy, as was the case for ODA and by default ODAT.

If conveyed appropriately, a sustainable procurement policy (or at least a sustainability component within an overall procurement policy as per ODA’s approach) gives ‘gravitas’ and sends a clear message to a sometimes conservative procurement team that sustainability is important to the leadership team and to the project as a whole. However, the presence of a policy in itself will not guarantee good outcomes, and it needs to be developed in collaboration with other key disciplines and be integrated with existing sourcing governance and policy structures.

(c) Influence of Delivery Method and Contract Type

As outlined in Part II Section C(3), ODAT used various contract types to deliver both Orient Way and West Ham. It procured design contractors for the reference design for Orient Way, namely ARUP, who provided that reference design as part of the design brief for the detailed design contractor Atkins. This detailed design contract fell under the main design and construct contract held by Balfour Beatty, so that Atkins was a sub-contractor to Balfour Beatty. As discussed, similar contractual arrangements were in place for West Ham.

A design and construct contract requires the contractor to tender on the works described in the design brief which has been prepared by the proponent, or by a party on behalf of the

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816 See Part III Section B(6).
817 SMA was, however, in the process of developing a Sustainable Procurement Policy, Guidelines and Sustainable Sourcing Category Matrix to guide ethical and sustainable procurement. Interviewee SS1.
818 CIPS Knowledge Works, above n 208, 4.
proponent\(^\text{819}\) as was the case for Orient Way. The contractor not only tenders for the construction of the works described in that design brief, but also for the completion of the detailed design, consistent with that design brief.\(^\text{820}\)

The design and construct contract is an improvement on traditional contract types where, for example, the detailed design has been performed by the proponent prior to entering into a contract with the construction contractor. In many traditional delivery methods, each element of the infrastructure delivery process is conducted by a different party under a separate contract and each with a mandate for cost minimisation.\(^\text{821}\) This can lead to distinctive ‘stops and starts’, for example where designers hand-over to construction contractors. This compartmentalisation can prevent the alternate, long-term or whole of project life thinking necessary to drive sustainability outcomes.\(^\text{822}\)

Benefits of the design and construct contract, which have implications for infrastructure sustainability, include that the construction contractor can bring construction expertise into the design process, and therefore enhance constructability or buildability. This is also known as early contractor involvement. Ugwu et al state that:

> Constructability is critical to translate sustainability-driven design solutions into constructed facilities in practice. This is because any sustainable design decisions and/or specifications made in earlier stages could be changed into other unexpected forms at the construction stage due to constructability problems ... both early contractor involvement and early supplier involvement would minimise constructability-related problems including cost associated with delays, claims, wastage and rework etc.\(^\text{823}\)

This has implications for sustainability because the contractor will be able to provide input as to whether a certain target or initiative can be practically implemented, for example whether a certain lighting fixture may be too difficult, time consuming or costly to install. Ugwu et al’s observations about the importance of early contractor and supplier involvement in minimising constructability-related problems are therefore highly relevant. Also of relevance

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\(^{820}\) Ibid.

\(^{821}\) Hartshorn et al, above n 11, 173.

\(^{822}\) Hartshorn et al ibid; Vanegas, above n 15, 5366.

\(^{823}\) Ugwu et al, above n 79, 249.
is the need not only for early contractor involvement, but also early maintenance and operator involvement to minimise what Pearce et al call ‘unintended negative system interactions’.\footnote{824} Examples of such interactions include increased bacterial growth and reduction in water quality in water supply lines due to reduced flow rate from conserving water fixtures.\footnote{825} In such cases, an initiative may achieve improved environmental performance but is ultimately unsustainable because it compromises the health, safety or quality of life of occupants, or the personnel who operate and maintain them.\footnote{826} This also relates to the discussion in Part IV Section B(9) on understanding the true sustainability of an initiative – an issue further discussed below.

Early contractor and supplier involvement can be facilitated through delivery methods which involve partnering\footnote{827} such as design and construct contracts, but even more so in alliance and public private partnership (PPP) contract types.\footnote{828} Further – and as will be discussed below – PPP contract types can allow for long-term operational requirements to be a key factor when examining the feasibility of sustainability initiatives.\footnote{829} It is important, however, that constructability is not used to ‘design out’ initiatives developed at early stages of design in the name of budget savings and/or simplifying the construction process, or based on contractor perception of difficult or unreasonable demands, as is discussed in the context of buildings by Pulaski et al and Pulaski and Horman.\footnote{830} Contractors should be held accountable through a tracking and checking process, as is discussed in Section 4 above.

Disadvantages of the design and construct contract include that the contracting parties still have a mandate for cost minimisation, unless required to address infrastructure sustainability through procurement processes, as discussed below in the case of ODAT’s and SMA’s design and construct contract-related sustainability requirements. Further, unless the proponent has a good ‘handle’ on sustainable design and is able to translate it into contracts, as was expressed

\footnote{825} Ibid.
\footnote{826} Ibid.
\footnote{827} Ugwu et al, above n 79, 248.
\footnote{828} See Part III Section B(6).
\footnote{829} See also ibid.
\footnote{830} Pulaski et al, above n 71, 89; Pulaski and Horman, above n 299, 1275; See also Part III Section B(4).
as important by interviewee OL2, it is unlikely that the contracting parties in a design and construct contract will adopt infrastructure sustainability of their own accord because they will not see the benefits of going ‘above and beyond’. Demaid and Quintas articulate this issue well. They state that ‘it is not in [contractors’] interests to instigate innovative solutions, whatever the notional imperative, as this would add to the risk, together with its [perceived] concomitant up-front costs’. They add that ‘[sustainability] solutions that are not cost-effective will not be proposed unless instigated by [proponents], demanded by legislation or come from accepted, local business ethics.

Such observations may be true for design and construct and other such contracts, but different contract types (as outlined above) do exist that are more conducive to contractors adopting infrastructure sustainability. For example, the PPP contract type allows delivery partners to work together as an integrated team, as would have been the case for the Sydney Metro project based on the IMO contract. As discussed by interviewee SS4, the benefit of having a PPP type contract in terms of infrastructure sustainability is that the PPP has to operate it for a number of years and as a consequence would endeavour to put in a fully-functioning system that adopts a whole-of-life thinking approach, where only a minimal amount of work needs to be put in.

This correlation between PPPs and whole-of-life thinking could be formalised through a whole-of-life costing policy that makes whole-of-life thinking and costing part of day-to-day decision-making. Despite the actual delivery method, if the proponent is the end user or asset manager of an infrastructure facility, it may also wish to adopt a whole-of-life costing policy, and translate the policy commitments into contracts with its delivery partners, because it too

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831 See Part IV Section B(7).
832 See Part III Section B(8).
833 As demonstrated in Part IV Section B(9), many infrastructure sustainability initiatives can be implemented with little impact on upfront capital costs.
834 Demaid and Quintas, above n 96, 603.
835 Ibid. Here the authors are highlighting the importance of various drivers for contractors to adopt infrastructure sustainability. Drivers in the context of the case studies are discussed in Part III Section A and Part IV Section A.
836 See Part III Section B(6).
will accrue the benefits of investing upfront to achieve efficiencies and other benefits in the longer term.\footnote{837}

It is also interesting in the case of PPPs because the consortia is inheriting all the risks. If it puts in concrete with a high recycled content and it did not work in practice, then it might require repairing every six months. The PPP will therefore have much interest in ensuring it is adopting initiatives and technologies that are well researched and proven. According to interviewee SS4, ordinarily the risk is that if you give a contractor a job they will often do it as cheaply as they can just to meet the minimum standards, as alluded to above. But a PPP will want to put in the best technology so that it does not have to replace things in ten years time.

The SMA case study therefore reveals that PPPs are inherently conducive to infrastructure sustainability and sustainability outcomes. However, a commitment to, and process for, researching the feasibility of initiatives and technologies is critical. Using the recycled concrete example – although it is likely a good sustainability initiative from an environmental performance perspective, if the concrete is not going to perform to the required specifications and needs replacing more frequently than a standard product, it will not be a favourable initiative for the PPP. A process for researching the feasibility of initiatives and technologies is included in the framework in the following part.

Another example of incentive-based relationship contracts are alliance contracts. The legal and commercial framework for an alliance not only enables the partners to work together to achieve the project objectives, it rewards all partners for achieving better than expected outcomes, and importantly for sustainability, financial imperatives are not the sole driver.\footnote{838} In an alliance, social and environmental issues are considered at the highest level of key result areas, which are essentially objectives against which the performance of the alliance partners can be measured and where appropriate, rewarded.\footnote{839} However, such a contract type

\footnote{837 However, in some large organisations there may be a degree of separation between the department or division that delivers projects and the operator, including maintenance, side of the organisation. This separation may be amplified by segregated budget provisions. Such separation could inhibit effective communication of operational requirements and the implementation of whole-of-life costing.}

\footnote{838 Scanlon and Davis, above n 402, 124-125.}

\footnote{839 Ibid, 125.}
may not always be viable or appropriate for a project depending on its size, scale, cost and other considerations.

Despite the inherent constraints associated with design and construct contracts in facilitating sustainability outcome as discussed above, the tenderers’ responses to the sustainability requirements were viewed as innovative and appropriate for the Sydney Metro PRI design and construct contract. \(^{840}\) This could have been a result of the number of companies working together to form the PRI tendering organisation, which would have provided a larger pool of sustainability capacity and resources. It could also have been a product of the level of detail and effort that went into SMA’s sustainability requirements, which sent a clear message that sustainability was important to SMA and tenderers would be evaluated on it. \(^{841}\) This is supported by the ODAT case study because it was acknowledged that the industry did, in the end, respond well to the sustainability requirements because sustainability was clearly communicated as an integral value and overall vision of the Games, and as interviewee OD1 observed, ‘if you’re a contractor, then you adopt that mantra if you want to be successful’. \(^{842}\) There was also the enabling activities of ODAT employees being active on-site to influence contractors’ behaviour \(^{843}\) and consultation with industry on its proposed sustainability targets. \(^{844}\)

Care should therefore be taken in assuming that infrastructure sustainability and sustainability outcomes will be immediately constrained by the delivery method, as many variables will be at play on each project. The main variable is whether sustainability is communicated very clearly to be a key value, vision and decision-making factor of a project proponent. Other variables include the tenacity of sustainability advisers (if present) in encouraging commitment across the project team and contractors by being active on-site. Also of importance is whether sustainability objectives and targets are actually translated into procurement documentation so that contractors are compelled to adopt infrastructure sustainability, regardless of the type of contract. Theoretically therefore, provided there is a sound infrastructure sustainability governance approach, the delivery method should not

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840 See Part III Section B(6).
841 See Part III Section B(6).
842 See Part IV Section B(7).
843 See Part IV Section B(7).
844 See Part IV Section B(6).
greatly affect the ability to achieve meaningful sustainability outcomes because such an approach would address all of these variables. However, the relationship between various delivery methods and contract types, and infrastructure sustainability, should be further explored.

(d) Understanding Delivery Method when Developing Sustainability Requirements

The case studies indicate that the delivery method and contract type will influence the level of detail needed or desirable in setting sustainability requirements in the procurement documentation. The delivery method, for example a design and construct or PPP type contract, will affect how each project stage (Figure 1) is undertaken in terms of timing, and hence the level of detail available about a project at the procurement stage will differ from project to project.

In the SMA case study, it was observed that a challenge in articulating sustainability requirements in the RFP documentation was the lack of detail known about the project. As observed by interviewee SS2, because the design was only at reference design stage when the procurement documents were being developed, the successful contractor could have significantly altered the design including the sustainability targets and initiatives during the detailed design stage. This would have been appropriate because that was the role of the bidding consortia – they needed to deliver a workable metro system. However, it did mean that a lot of the work done by the PBACH team and the other sustainability advisers in developing the SIR which informed procurement processes with sustainability targets and initiatives, for example for renewable energy and materials, may have become redundant.

Carefully planning the time and resources to be spent in investigating sustainability targets and initiatives prior to later design stages is therefore important. There must be a balance between the amount of work done to inform the sustainability requirements, the outcomes the proponent desires, and ‘trust’ in the market to come back with and deliver outstanding results, as discussed below. This balance must be struck on a case-by-case basis, which is discussed in more detail below.

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845 See Part III Section B(8).
846 See Part III Section B(3).
There will be some instances where the proponent can require certain sustainability initiatives regardless of any constraints associated with the stage of delivery. For example, if a proponent has a firm vision for the design of a station, it may have an internal design team develop detailed specifications to achieve this vision, or have its internal design team work closely with the design contractors to ensure its vision is being worked towards. In these circumstances, there may be little scope for the successful detailed design and construction contractors to alter the design, except where there are potential constructability or other issues. In such a situation, the proponent can be quite specific about its sustainability requirements because it knows what it wants the project to achieve in terms of sustainability outcomes. However, the proponent’s design team needs to have a good ‘handle’ on how to optimise sustainable design, and then be able to translate it into design briefs and contracts, in order for meaningful sustainability outcomes to materialise.

(e) Testing and Trusting the ‘Market’ and being Non-Prescriptive

Both case studies revealed that a certain amount of trust needs to be placed in the ‘market’, as in the companies qualified to tender for the work, and that this is achieved through being non-prescriptive in procurement processes. At the same time, there is a need to test the market’s ability to achieve the sustainability outcomes desired before going out to tender, so that the proponent will have some idea that what it is asking for is viable.

Generally speaking, both ODAT and SMA adopted non-prescriptive approaches in their respective sustainability requirements, but they both provided adequate guidance for how to achieve the required level of performance. SMA provided the bidding consortia for both the IMO and PRI contracts with the SIR. And although the SIR contained actual sustainability targets and initiatives, the bidding consortia were encouraged to respond with their own targets and provide details of how they planned to reach those targets. In only a few instances was SMA prescriptive in terms of its methodology, as discussed in the next paragraph.

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847 See Part III Section B(6).
848 See Part III Section B(6).
In the case of ODAT, tenderers were directed to provisions in the London 2012 Sustainability Policy and the ODA’s Sustainable Development Strategy. For example for the West Ham project, contractors had specific requirements across most of the ODA’s 12 sustainability aspects that were linked to objectives, and in some instances to actual targets, namely for those targets that ODA had committed to such as 90 per cent of demolition material to be reused or recycled.

A key finding is therefore that a proponent should be prescriptive in those targets that it is not willing to compromise, and provide methodologies to be used that it is comfortable with, so that it can simplify the tender evaluation process. An example of this can be found in the SMA case study, where the IMO tenderers were required to detail their methodology for undertaking a carbon or greenhouse gas assessment in accordance with ISO 14064-2:2006 Greenhouse Gases (Parts 1, 2 and 3). It will be important to clearly articulate as sustainability requirements those sustainability targets and initiatives that the proponent is certain it wants to achieve, for example to offset 100 per cent of operational GHG emissions in the case of SMA, or the 90 per cent target for recycling and re-use of materials for ODAT.

Such definite sustainability targets may be commitments made to external stakeholders, for example through the sustainability policy or a strategy document, or may be considered too important for maintaining or enhancing the reputation of the project and proponent, and hence the proponent would need to deliver on them. A prioritisation process, as well as the drafting of the sustainability policy, as discussed in Sections 3 and 2 above, can help the proponent better understand what sustainability objectives and targets it is not willing to alter throughout project delivery.

The proponent will need to ensure that sustainability targets are viable before specifying them through the procurement process. Where sustainability targets are determined to be critical, putting in resources for exploring their feasibility would be well justified, provided the

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849 See Part IV Section B(6).
850 See Part IV Section B(3).
851 See Part III Section B(3).
852 See Part IV Section B(3)
853 For example as SMA did when developing its greenhouse gas offset target. See Part III Section B(10).
proponent knows something about the shape and form of the project, and the targets in question will not be severely compromised by later stages of design or construction. In addition to the above activities, this compromise could be avoided through early contractor involvement,\textsuperscript{854} even at reference design stage where possible. Further, undertaking consultation on sustainability targets early on, for example with industry associations as discussed above, would also assist in ensuring any target commitments could feasibly be met, without having to ‘test’ the market through procurement processes.

Having monitoring mechanisms in place will be crucial for ensuring that targets are not being compromised in later stages of design or construction. This is further discussed in Section 9 below. Even if the proponent knows what sustainability targets it wants to achieve, it should avoid being specific about what initiatives should be used to fulfil the sustainability objectives and/or targets because it would not want to ‘lock’ in technologies or approaches into contracts that may be redundant within – say – a ten year delivery time-frame.\textsuperscript{855} Instead, the proponent should encourage good performance, and articulate its sustainability objectives and sometimes targets, but generally not specify the process to get there.

For those sustainability objectives where the proponent is not completely sure what is achievable, it would be appropriate to go to the market. Based on the aforementioned potential for resources spent to become redundant, it can be recommended that the proponent should clearly communicate what its sustainability objectives are across the various sustainability categories to the market, for example for renewable energy on-site which was an objective for ODA,\textsuperscript{856} and then ask the tenderers to provide the detail (including actual targets) on how the objectives would be achieved.

The proponent should however still undertake due diligence through benchmarking and other studies to ensure some level of feasibility, and facilitate knowledge sharing workshops\textsuperscript{857} to obtain information on what is possible, without actually doing the detailed feasibility and other such studies. This would help ensure the proponent does not ‘shoot itself in the foot’

\textsuperscript{854} The importance of early contractor involvement for achieving sustainability outcomes is discussed at length by Ugwu et al (above n 79) and above in Section 4. As discussed above, early contractor involvement can be achieved in relationship type contracts such as alliances.
\textsuperscript{855} See Part III Section B(4).
\textsuperscript{856} See Part IV Section B(3).
\textsuperscript{857} The importance of these workshops is discussed by Scanlon and Davis above n 402, 129-130.
with what it is asking contractors to do, particularly if the proponent is also the asset manager and significant risk could be placed on it, for example where an initiative ends up impacting on durability or becomes problematic to maintain.\textsuperscript{858}

The tenderer should then demonstrate what sustainability targets it thinks it can achieve, and how it will go about doing it for each objective and/or category. The ‘doing it’ should be monitored and reported back to the proponent and other stakeholders as part of the broader sustainability framework or plan, which should also be required as part of the RFP documentation. The contractor’s framework or plan should also be integrated with the proponent’s exiting infrastructure sustainability governance approach, as was planned for the Sydney Metro project.\textsuperscript{859}

ODA in particular actively tested the market when developing its sustainability requirements. As discussed in Section 3 above in the context of developing its sustainability objectives, targets and initiatives, ODA engaged with industry on its sustainability commitments.\textsuperscript{860} This would have enabled industry to prepare for responding to the sustainability requirements for the various Games projects. This is a lesson to be learnt for the SMA case study, as there was no evidence of active consultation with industry in the development of the sustainability objectives, targets and initiatives, except for the expertise gained from having the PBACH sustainability advisers on board.

The ODAT case study suggests that relying on the market alone to deliver on sustainability can be fraught with difficulty. Interviewee OL2 discussed how ODAT had to ‘push’ contractors to implement its sustainability requirements.\textsuperscript{861} However, those observations seem to have been referring to earlier stages of the project program when Orient Way was being delivered, when perhaps the rail-specific construction industry did not have a good understanding or familiarity with such requirements.\textsuperscript{862} This unfamiliarity would have been amplified by the conservative nature of the rail sector in the United Kingdom (UK), as well

\textsuperscript{858} See above Section 4.
\textsuperscript{859} See Part III Section B(6).
\textsuperscript{860} See Part IV Section B(6).
\textsuperscript{861} See Part IV Section B(7).
\textsuperscript{862} Ibid.
as its restrictive rail standards.\textsuperscript{863} The nature of responses from the market in terms of ODAT’s urban rail projects was also dependent on the initiative or objective in question. For example on West Ham, spectator-powered lighting is being trialled, demonstrating that industry can rise to the challenge by providing innovative ideas\textsuperscript{864} and creative excellence. However, the traditional rail sector companies were not coming up with such an idea, but rather it was technology companies that work across various sectors.

ODA saw the construction industry more broadly as having responded with innovative ideas to the sustainability requirements, especially for Games-related buildings and stadiums.\textsuperscript{865} And certainly the SMA case study demonstrates the willingness and capacity of industry to respond ‘above and beyond’ on sustainability requirements. But in SMA’s case, the consortia relationship between the different companies provided a larger pool for innovative ideas and creativity, and more capacity to source the right information to respond to the in-depth sustainability requirements. This indicates that the delivery method will influence the ability of the market to respond to sustainability requirements – although this needs to be explored in further research as discussed above.

\textbf{(f) Further Comparison of ODAT and SMA Specific Sustainability Requirements}

It is useful to go into further detail in comparing the different sustainability requirements for ODAT and SMA. SMA went a step further than ODAT in that it required a sustainability plan to be developed. This can be attributed to the differences in delivery method as discussed above, in addition to the scale of the project. SMA was to form part of a PPP involved in detailed design, construction and operation of a large-scale project. Therefore a sustainability plan that articulated how all of the key infrastructure sustainability commitments were to be addressed would have been critical. SMA also asked for a sustainability manager in the RFP documentation. This was not needed for ODAT because again it is underpinned by a different delivery method. ODAT is managing operations of the Games transport projects itself, along with existing transport agencies, and is active on-site.

\textsuperscript{863} See Part IV Section B(7) and Scanlon and Hodgson, above n 46, 48.

\textsuperscript{864} Promoting innovation is important because, as discussed in Part I Section A, it is a fundamental principle of infrastructure sustainability.

\textsuperscript{865} See Part IV Section B(7); Whittaker et al, above n 206, 21.
Therefore ODAT can rely on its own sustainability managers and other relevant professionals.

One of the most significant sustainability ‘wins’ in terms of ODAT’s sustainability requirements is the use of the CompeteFor website.\textsuperscript{866} This website provided opportunity for local companies to tender for work, including for the spectator-powered lighting initiative.\textsuperscript{867} Assessing the actual equal opportunity and local economic development benefits resulting from this website should form part of a post-construction review of the success of ODA and ODAT’s infrastructure sustainability activities.\textsuperscript{868} SMA did not adopt an approach similar to CompeteFor, although it could have considered it in consultation with its main delivery partners for the smaller contracts once the IMO and PRI contractor were engaged. For the larger principal contracts, namely the IMO and PRI, limiting tendering opportunities to only local companies would not have been possible given the considerable expertise needed to deliver a new metro system – expertise that needed to come from organisations operating in other jurisdictions such as the UK. However, other opportunities could have been considered by SMA for local and ‘sustainable’ employment. For example, the GreenSkills initiative\textsuperscript{869} could have been further investigated, and SMA could have put the PRI and IMO contractors and their subcontractors in touch with Indigenous employment service providers.\textsuperscript{870}

An important lesson to be learnt from both case studies is that a consistent message needs to be communicated through all relevant components of procurement documentation.\textsuperscript{871} This includes for example linking in with design procurement requirements, and requiring that the tenderer identifies interfaces with infrastructure sustainability and environmental management plans and activities.\textsuperscript{872} This is consistent with ODAT’s approach where provisions in the London 2012 Sustainability Policy need to be referred to and included by

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\textsuperscript{866} See Part IV Section B(3).
\textsuperscript{867} See Part IV Section B(6).
\textsuperscript{868} See in general Part VII.
\textsuperscript{869} See Part III Section B(8).
\textsuperscript{870} Indigenous employment service providers play an important part in supporting Indigenous job seekers to develop skills and take up employment opportunities in Australia. Further information can be found at <www.fahcsia.gov.au/sa/indigenous/progser/families/cdep/CDEP_program_guidelines/Pages/employment_service_providers.aspx> at 25 May 2011.
\textsuperscript{871} See Part III Section B(6).
\textsuperscript{872} Ibid.
the procurement team when developing RFP documentation. However, judging from the West Ham documentation reviewed by the author, there was not the same degree of integration of sustainability requirements across the different schedules and contract clauses – for example relating to design and construction-related plans and procedures – as there was for the Sydney Metro IMO and PRI contracts.

Further criticism of how ODAT’s specific sustainability requirements were articulated in the West Ham project information document was also raised in Part IV Section B(6). They related mainly to ambiguities in language, for example where tenders were asked to pay ‘particular attention to reuse, recycled methods and use of raw materials.’ It was suggested that more directive language is needed that links back to ODAT’s sustainability objectives and targets, for example with materials, requiring that contractors actually minimise use of raw materials. In comparison, SMA’s sustainability requirements, although not prescriptive, were more aligned with its sustainability objectives with arguably more direct language used. For example, with respect to the sustainability plans to be developed for both the PRI and IMO scope of works, SMA was clear about what it expected to go into the plans including methodologies for monitoring, auditing and corrective action.

Of interest is that the West Ham project information document did not specify the methodology for the contractor to undertake a carbon footprint study, whereas the IMO consortia was required to use a specific standard. The decision to specify the use of a particular methodology will depend on how comfortable the proponent is that the methodology will help achieve the outcomes it seeks. Specifying methodologies may therefore need to take place on an initiative-by-initiative basis, and be informed by the research and development stage of developing sustainability objectives, targets and initiatives.

As previously stated, because ODAT’s projects have gone ahead, its activities in terms of ongoing implementation of sustainability requirements provides valuable lessons that cannot

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873 Ibid.
874 Ibid.
875 Ibid.
876 See Part III Section B(6).
877 See Part IV Section B(6).
878 See Part III Section B(6).
be gained from the SMA case study. One of those lessons relates to being active onsite for ongoing implementation of infrastructure sustainability.  

(g) Sustainability Assessment Rating Tools as Complementary

In addition to specific sustainability requirements written into RFP documentation and subsequent contractual arrangements, ODAT relies heavily on existing sustainability requirements found in CEEQUAL. ODAT uses CEEQUAL as a kind of addendum to its procurement processes. Typically, ODAT requires contractors to achieve a minimum CEEQUAL rating of ‘very good’, but in some cases such as with the West Ham project, strive for an ‘excellent’ rating.

The use of CEEQUAL as a tool by ODAT suggest that it views CEEQUAL as being robust and reliable, and therefore suitable for specification. However, the problem with specifying the use of a tool is that it might not actually tell the proponent what sustainability targets or initiatives the contractor will implement, it will only help ensure that the score being requested is achieved. Therefore, specifying a tool will not provide much information about the contractor’s approach to infrastructure sustainability at the procurement stage, but rather places the onus on the provisions of the tool to achieve good outcomes. Relying heavily on a tool will only be beneficial if the tool itself is capable of achieving the desired outcomes.

A criticism of tools such as CEEQUAL is that they come in too late in the project delivery phase – they do not necessarily facilitate the development of sustainability objectives, targets or initiatives early on, even if the tool is used by the proponent at early stages of design and planning as a kind of ‘checklist’. This is largely because, as discussed in Part IV Section B(9), these tools do not provide adequate guidance on developing governance mechanisms to achieve the required performance.

If a tool is mainly applicable to detailed design and construction stages, many opportunities may have been lost at earlier stages where greater sustainability outcomes are possible. This is especially an issue where a proponent and its delivery partners have not been

879 See Part IV Section B(7).
880 See Part IV Section B(6).
881 See below Section 8.
882 Vanegas above n 15, 5368.
Part V Section B

compelled to embed infrastructure sustainability thinking early on due to a lack of governance for infrastructure sustainability and sustainability outcomes, and rely only on a tool to achieve good environmental and/or social outcomes. This means the project management and governance categories of such tools need to be better supported by reference to appropriate guidance for establishing such governance mechanisms, as is provided by the framework in the next part. Further discussion on CEEQUAL can be found in Section 8 below.

In case of ODAT, the achievement of its sustainability targets by its contractors is also facilitated through active engagement and working closely with contractors on-site.\textsuperscript{883} This is despite ODAT typically using a design and construct contract method which would usually see the proponent at ‘arm’s length’, unlike in an alliance or PPP contract. Further, in the case of ODAT, there has been a structured governance framework in place since early on. Therefore, much of the conceptual design and planning of its projects done in-house is undertaken in line with its strong sustainability agenda, as discussed throughout Part IV. Hence, ODAT has a good ‘handle’ on embedding infrastructure sustainability upfront, so specifying the use of CEEQUAL has been complementary.

The SMA case study does not provide significant insights into the application of sustainability performance assessment or rating tools in procurement processes. This is because of the early stage of project delivery that Sydney Metro was at when it was deferred, in addition to the fact that the AGIC tool was still in the very early stages of development when it might have been applied. It is unclear from the data to what extent the bespoke Green Star tool for stations\textsuperscript{884} was used for the purposes of procurement, or whether it would have been provided to the respective consortia design teams at a later stage.

(h) The Role of Sustainability Advisers

As demonstrated above, it is important that sustainability advisers have a good understanding of procurement processes, including delivery method. They need to understand what stage the project is at when procurement of delivery partners is taking place. And as discussed above, they should consider the amount of resources that need to be spent on developing business

\textsuperscript{883} See Part IV Section B(7).
\textsuperscript{884} See Part III Section B(10).
cases and other decision-support activities if the initiatives being decided may later change to an extent the original work becomes obsolete.

Another critical role of sustainability advisers as found in the SMA case study is to encourage and capacity build the procurement staff to input the sustainability requirements. This includes working with the varying degrees of knowledge and understanding of procurement employees, as well as using appropriate language. They also need to know where to input sustainability requirements within the different procurement components such as in relation to different stages of design and environmental management. This integration is critical to achieving meaningful sustainability requirements, as found in the SMA case study. There is also a role in capacity building and changing ‘attitudes’ of parts of the construction industry more broadly as found in the ODAT case study. These activities link to the section below on roles and responsibilities; and more specifically the roles, responsibilities and attributes of the sustainability advisers.

(i) Accounting for the Speed of Project Delivery Processes

A key challenge that arose in the SMA case study related to the speed at which some project delivery processes were taking place – meaning there was limited time to articulate infrastructure sustainability into the different processes. Interviewee SL2 even indicated that more sustainability resources would have been useful in this context. This challenge of delivery processes often moving quickly also brings into question the linear project delivery phase outlined in Figure 1 in Part I. Although the figure is based on the literature, in the real world project delivery is rarely a tight linear process. This does not necessarily make the figure redundant, but it indicates that the figure is really only a guide, and care should be taken to not ‘pigeon hole’ project delivery processes and stages, as some may happen concurrently. This is why mapping out what is ‘going on, when and who is responsible for what’, as discussed by interviewee SS2, is so important. Such an activity forms part of the

885 See Part III Section B(8).
886 Ibid.
887 See Part III Section B(6).
888 See Part IV Section B(7).
889 See Part III Section B(9).
890 See Figure 1 and accompanying footnote.
891 See Part III Section B(8).
framework in Part VI. Further, there are some advantages in different project delivery processes and stages happening at the same time. The main advantage is that there can be consistency and a continuum in terms of infrastructure sustainability ‘messages’ and activities.

(j) Proposal and Tenderer Evaluation
In an ideal world, including infrastructure sustainability in the tender evaluation process will help achieve sustainability outcomes because: i) the proponent is placing a percentage (or other) value on infrastructure sustainability in the decision-making process, and ii) tenderers without a corporate sustainability agenda and infrastructure sustainability experience can be effectively ‘filtered out’. However, a comparative analysis of the two case studies reveals constraints – and provides lessons learnt – associated with embedding infrastructure sustainability into the tender evaluation process.

In the case of ODAT, the West Ham procurement documentation reveals that ODAT evaluates tenderer performance based on whether the tendering company has a sustainability policy and management system. SMA did not ask for this specifically, but rather assessed performance based on response and approach to the sustainability requirements, including the nominated sustainability manager’s credentials. In SMA’s case, the evaluation criteria was integrated throughout the different evaluation sections including under the overall vision, business plan and approach section, and in the design and technical solutions section.

The SMA and ODAT case studies both suggest that infrastructure sustainability will unlikely be a huge proportion of the total percentage evaluation criteria. In the words of interviewee SS2, it is ‘never going to be more than five per cent of any decision on a tender’. This indicates that getting the right balance of sustainability requirements so that the proponent can meaningfully evaluate the responses is critical.

The proponent needs to be able to separate a good tender from the rest in terms of infrastructure sustainability, and use the full potential of procurement processes to achieve

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892 See Part IV Section B(6).
893 See Part III Section B(6).
894 Ibid.
895 Ibid.
the desired sustainability outcomes. The prioritisation process discussed above could assist in picking out the most important sustainability objectives and targets and asking the tenderer to concentrate on them, thereby separating out the most important issues to make the tenderer evaluation process more meaningful.

In an ideal world, infrastructure sustainability should be central to project delivery decision-making, including in relation to procurement processes. A complete analysis and re-design of conventional procurement processes so that sustainability is inherent and the ‘centre-piece’ (including in decision-making/evaluation criteria), as opposed to integrated, would be groundbreaking. Perhaps the infrastructure industry is a long way off from such an overhaul. However, it is important to consider it as an area for further research and practice.

Some of the interviewees for SMA observed that there were difficulties in selecting the tenderers based on sustainability considerations, suggesting that perhaps the right balance was not found. This was mainly because the procurement questions and schedules on sustainability provided SMA with information which did not necessarily allow for easy comparison of one proposal against another. For example, there were different metrics and calculations used.

The most appropriate way to overcome this challenge is by providing the tenderers with the boundaries – such as methodology and calculation tools – to ensure there is a level playing field. This is confirmed by the fact that ODAT does not seem to face this challenge because it uses CEEQUAL as a key part of its sustainability requirements, which instantly provides a level playing field for tenderers because they are required to use the same tool, albeit that it does not necessarily tell ODAT what sustainability targets are going to be achieved or initiatives implemented, as discussed above. ODAT has not asked for specific sustainability targets to be created or met in its procurement documentation, but rather relies on provisions in the tool to help ensure infrastructure sustainability and sustainability outcomes materialise. But it is acknowledged that a tool alone will not guarantee these outcomes for ODAT and that other factors have to be at play, as discussed above.

896 See Part III Section B(8).
897 Ibid.
898 Namely based on achieving an ‘very good’ rating. See Part IV Section B(6).
When articulating sustainability requirements, the level of detail of these requirements will depend on many factors including whether a tool is available that will help achieve the proponent’s sustainability objectives and agenda, and whether there are some targets that the proponent is unwilling or unable to compromise. However, to ensure that the proposals can be evaluated, the ‘boundaries’ for developing sustainability targets and undertaking assessments or calculations, for example for climate change risk assessment, should be articulated in the RFP documentation. Using this approach will ensure that outputs and approaches to addressing the proponent’s sustainability requirements will be presented in a similar manner and therefore facilitate a fair evaluation.

A final consideration for proposal and tenderer evaluation is ensuring the tenderer shares the same value as the proponent, as found to be important in the SMA case study.899 This can be achieved in part through interviews with not only the sustainability advisers, as discussed further in Section 7 below, but also with the proposed project manager and other key decision-makers, to ‘test’ their understanding and appetite for sustainability outcomes. ODAT’s question regarding whether the contractor has a sustainable development policy and management system is also useful in this context.

Interviewing potential sustainability managers as part of the IMO and PRI contracts did not appear to have been undertaken in the SMA case study. However, this may be due to the early deferral of the project before such interviews could take place. This issue is not so relevant for ODAT because it already has internal sustainability managers who will be involved at the operational phase.

(k) Key Findings – Procurement Processes and Infrastructure Sustainability

It is important for the proponent and project team to understand and acknowledge the need to integrate infrastructure sustainability with procurement processes. The commitment needs to be articulated through the main procurement policy and strategy as well as across other relevant documents and processes. In addition, a specific sustainable procurement policy and subsequent plan or strategy is favourable.

899 See Part III Section B(6).
There is also a need to understand the opportunities and limitations presented by the delivery method and contract type. Traditional contract types are typically unconducive to infrastructure sustainability because of the focus on cost minimisation. The same may be true for design and construct contracts, however early contractor involvement facilitated by this contract type can be beneficial for infrastructure sustainability. The most advantageous contract types appear to be relationship-based contracts, including alliances and PPPs. However, there is a need to explore this finding in greater detail in further research as discussed in Part VII. And despite this inherent conductivity or otherwise to infrastructure sustainability, each project will present distinct and individual features, challenges and opportunities for achieving sustainability outcomes. Establishing a robust approach to governing infrastructure sustainability will help to navigate these challenges and maximise opportunities.

The level of detail the proponent can specify will depend on the stage of design and planning achieved when procurement of the delivery partners takes place, but more importantly its knowledge about what sustainability outcomes are possible, and its ability to translate that into design briefs and contracts. At the same time, a balance needs to be found between the amount of resources invested in developing sustainability targets and initiatives to be integrated into sustainability requirements and the detail known about a project – if the project changes considerably, the effort and resources spent may be redundant.

The market can generally be relied on to provide innovative ideas and technologies, provided the scale of the project allows for it. However where applicable, it is important to specify or prescribe the methodologies or sustainability targets that the proponent is not willing to compromise. This will also help ensure a level playing field and that proposals can be easily evaluated – one against the other. However, there is also a need to strike the right balance between detail and being non-prescriptive so as to encourage innovation, while not compromising on important commitments. The balance will depend on the procurement process, including the delivery method, and would have to be explored on a project case-by-case basis.

Integration and embedment of sustainability requirements throughout all relevant procurement documentation, including relating to design and environmental management, is
critical. Also of importance is requiring contractors to develop a sustainability plan that will fit in with the proponent’s existing approach. The plan should nominate suitable interfaces with other documents and processes such as the environmental management plan.

There may also be a need to require contractors to have sustainability manager/s on their team. The proponent should request information on a manager’s qualifications and experience, while ensuring that those assessing the responses can discern what qualities are favourable. It will also be useful to interview the proposed sustainability manager/s where possible to ensure the right ‘fit’. And even if it is a design and construct contract, a sustainability manager may still add value in embedding infrastructure sustainability across design and construction activities – unless the proponent has a suitable sustainability manager who can be across these activities as is the case for ODAT.

In terms of specifying the use of a sustainability assessment rating tool, it should only be viewed as a component of the whole approach to achieving sustainability outcomes through procurement, and ideally the achievement of a certain score should be specified. This is largely because of limitations associated with tools, as further discussed in Section 8 below, but also because they do not necessarily ‘capture’ the sustainability objectives and targets that the proponent wants to achieve. Hence, tools should be used on a complementary basis, in addition to sustainability requirements written specifically to suit the context of the project in question, which strike the necessary ‘balance’.

The sustainability advisers have a critical role to play in articulating and embedding the sustainability requirements into the relevant procurement documentation. They need to understand the delivery method and map out what is going ‘in and out’, and who is responsible for what. Other important activities include consulting and capacity building the procurement team; finding out what sustainability targets and initiatives are viable including in consultation with the design team; and consulting externally with industry such as through an industry association (and other external stakeholders where appropriate). Then in follow up, it is important to be active on-site (as in during construction) to ensure that targets are being met and sustainability outcomes are materialising ‘on the ground’.
7 Roles and Responsibilities

(a) Overview

Assigning responsibility for certain infrastructure sustainability and sustainability outcomes to project team employees was essential in both case studies. Both also had an overall organisational structure for sustainability including sustainability advisers, and both revealed desirable and necessary attributes of those advisers. This section compares and contrasts the two case studies in terms of organisational structure for sustainability. It then discusses the importance of finding the right mix of roles and responsibilities, and seeking sustainability advisers with desirable attributes. The discussion informs the framework in the next part.

(b) Comparing the Organisational Structures for Sustainability

Both ODAT and SMA assigned responsibility for infrastructure sustainability and sustainability outcomes at the upper echelons of the organisation. In the case of SMA, sustainability was largely the responsibility of the General Manager (GM) Planning.\textsuperscript{900} For ODAT, ultimate responsibility rests with the Director of Transport, but the Head of Transport Systems and Games Safety is particularly active in infrastructure sustainability, including because he is responsible for the integrated HSSEQ system of which the SuMS is part.\textsuperscript{901} ODA has also assigned responsibility for infrastructure sustainability at very high levels of its organisation.

It seems logical that these leadership-level actors are also key drivers of infrastructure sustainability activity, and will determine the need for sustainability advisers in the first place. Therefore, the value of having informed ‘champions’ for infrastructure sustainability at the leadership-level cannot be overstated. And importantly, a key assumption of the framework presented in Part VI is that there is this appetite and champion/s who are engaging sustainability advisers in the first place to implement the framework.

Electing a sustainability champion at the leadership-level could be a calculated act as opposed to happening ‘organically’ and/or by chance. A sustainability discipline employee

\textsuperscript{900} See Part III Section B(9).
\textsuperscript{901} See Part IV Section B(2).
may already be an employee of the proponent organisation, for example as a corporate sustainability manager. They may engage sustainability advisers to work on that particular project, but there is no specific champion at the leadership-level of that project team. The advisers themselves may then work to elect a champion at the leadership-level, and indeed some commentators discuss the importance of this activity. Not only is leadership-level such as GM support of infrastructure sustainability important, but so is CEO level support. Again, the existence of leadership-level support may be a driver of infrastructure sustainability in the first place, as it was for ODAT. However, it should also be sought after and nurtured by sustainability advisers as part of their roles and responsibilities.

ODAT’s Sustainability Manager has the role of integrating the SuMS into other project delivery and organisational systems and processes. Similarly, the Manager Environmental Sustainability in SMA’s case was instrumental in developing and implementing the Sustainability Management Framework. In concurrence with the above theory on the importance of the leadership-level champion, the Manager Environmental Sustainability role was conceived by the GM Planning Approvals.

SMA and ODAT’s organisational structures for sustainability can be easily compared by examining the figures found in both case studies (Figures 5 and 8). In SMA’s case, infrastructure sustainability came under the immediate control of the GM Planning Approvals, although there was also interface with the Project Director. There was no data to suggest that this organisational structure for sustainability was disadvantageous in any way. Of importance is the influence the GM could have had on other key decision-makers, including through personal relationships.

ODAT’s approach is perhaps more robust in that infrastructure sustainability is under direct control of Head of Transport Safety and Games Systems who has control over numerous project delivery processes. This can therefore facilitate meaningful integration. The most beneficial approach would be to have infrastructure sustainability owned by – and the responsibility of – all key decision-makers (see discussion on roles and responsibilities matrix below) with ultimate ownership at project director or CEO level as per ODAT and ODA.

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902 Bargwanna, above n 24; Scanlon and Davis above n 403, 126-127.
903 See Part III Section B(9).
In the organisational structural sense, the job titles of sustainability advisers is also of interest. For example in the SMA case, the sustainability manager’s job title was Environmental Sustainability Manager, even though the role was more holistic, not just dealing with environmental issues.\(^{904}\) It is recommended that the job title represent the more holistic view of infrastructure sustainability to prevent reaffirmation of any existing perceptions within the project team that sustainability is a purely environmental issue. Infrastructure sustainability should be identified as a separate work-stream, which was the case for both ODAT and SMA, so it does not get ‘absorbed’ into environmental management, but rather draws in and integrates with all other work-streams as per the associated themes.\(^{905}\)

(c) The Importance of Embedding the Advisers

In the case of SMA, having the sustainability advisers including the sustainability manager embedded in the project team was considered to be an important enabler of infrastructure sustainability.\(^{906}\) The importance of this embedment was made particularly clear by interviewee SL2.\(^{907}\) Similarly in the case of ODAT, it was found that having technical capabilities in sustainability ‘in house’ was beneficial for sustainability outcomes because there would be an existing level of understanding of the project and proponent organisation.\(^{908}\) The role that these advisers, and in particular the sustainability managers, played in embedding and integrating the SuMS and framework would no doubt have been far more difficult had they been external consultants that were seen as outsiders by the project team.\(^{909}\)

(d) Specific Advisory Activities

Other roles of importance in terms of sustainability advisers in SMA (and more specifically the PBACH sustainability advisers) included providing guidance and encouragement to the design team to adopt infrastructure sustainability in their day-to-day work. This included

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\(^{904}\) See Part III Section B(9).
\(^{905}\) See above Section 2 for list of recommended themes.
\(^{906}\) See Part III Section B(9).
\(^{907}\) See Part III Section B(9).
\(^{908}\) See Part IV Section B(8).
\(^{909}\) Scanlon and Davis, above n 402, 127.
weekly design meetings or workshops.\textsuperscript{910} A type of workshop format was also used by ODAT in the order to achieve good environmental performance on Orient Way.\textsuperscript{911} Both Bargwanna, and Scanlon and Davis, emphasise the importance of workshops for infrastructure sustainability. Bargwanna states that workshops should be undertaken once a project team has been established, with the aim of discussing project-specific opportunities for embedding sustainability.\textsuperscript{912} He further adds that it should comprise specialists from all disciplines and have leadership-level support and commitment, and that the workshops will help instil a culture of sustainability.\textsuperscript{913} Scanlon and Davis identify a number of workshop activities to be undertaken by sustainability advisers in developing sustainability outcomes for an infrastructure project, including prioritising sustainability issues and benchmarking.\textsuperscript{914}

Other activities of SMA’s sustainability advisers included capacity building, facilitating learning and innovation, and internal networking.\textsuperscript{915} In the case of ODAT, less data was found on the day-to-day activities of the sustainability advisers, for reasons discussed above. However for the ODA sustainability team, activities included linking planning conditions of consent to sustainability targets and initiatives.\textsuperscript{916}

(e) A Multi-Skilled Advisory Team

There were some contrasting opinions about the role of sustainability advisers across and within the two case studies. For example, interviewees OL2 and OS2 observed that having employees who understand the technology side of sustainability is crucial.\textsuperscript{917} Interviewee SS2 concurred with this, discussing the importance of having employees that actually understood the design and construction side of things, not just the governance side.\textsuperscript{918} In contrast, interviewee SL1 saw the role of sustainability advisers as being more of a coaching or

\textsuperscript{910} See Part III Section B(4).
\textsuperscript{911} See Part IV Section B(7).
\textsuperscript{912} Bargwanna above n 24, 5.
\textsuperscript{913} Ibid.
\textsuperscript{914} Scanlon and Davis, above n 402, 129.
\textsuperscript{915} See Part III Section B(9).
\textsuperscript{916} See Part IV Section B(5).
\textsuperscript{917} See Part IV Section B(8).
\textsuperscript{918} See Part III Section B(9).
mentoring role in motivating the rest of the project team to adopt infrastructure sustainability.\footnote{Ibid.}

It can be recommended that – depending on the size of the project and the resources able to be dedicated to infrastructure sustainability – a sustainability advisory team consist of various specialists covering the different sustainability themes, for example in greenhouse gas assessment or social issues, as well as a governance specialist. The governance specialist will concentrate on coordinating the approach to governing infrastructure sustainability. This person would have to be somewhat of a ‘generalist’ who is capable of i) taking the technical information given to them and applying it in the context of the project with help from other project team members, and ii) getting an initiative or target locked in and signed off at the leadership-level. This would be assisted by having the right attributes as discussed below. This governance specialist role was elaborated on by interviewee SS1:

I am persistent. I have built the relationships with the general managers, I have worked out how the bureaucracy works and I know how to write the briefing notes and I know who to talk to get on side so before they see the briefing note they know it’s coming – they are going to sign it off. And if three executives need to sign the briefing note, I know which one to get on side first because if he signs it the other two will sign it. So that is the “yes Minister” aspect of the game. But some of the technical guys that have written the report analysing the cost of renewable energy, I couldn’t do what they have done and they couldn’t do what I have done.

Having a sustainability advisory team comprise a range of specialists would help ensure that a ‘balance of competencies’ is achieved, the importance of which was discussed by interviewee OL2.\footnote{See Part IV Section B(8).} Having a multi-disciplinary, multi-skilled sustainability advisory team is supported by Mills and Glass in the context of building sustainability. They observe that few individuals could – on their own – possess the array of qualities necessary for achieving sustainability outcomes.\footnote{Frederick T Mills and Jacqueline Glass, ‘The Construction Design Manager’s Role in Delivering Sustainable Buildings’ (2009) 5(1 & 2) Architectural Engineering and Design Management 75, 89.} Therefore, if only one adviser can be placed on a project due to resource constraints, that individual should be adept at accessing the necessary technical and other information where they themselves cannot provide it. The most important qualities may
therefore be resourcefulness, and the ability to make technical information accessible and usable.

The specialists in the sustainability advisory team may spend only a few days of the working week as part of the sustainability team, with their role including inputting data on their relevant category into the measuring, monitoring and reporting component of the infrastructure sustainability governance approach (see Part VI). The rest of the time could be spent in another role such as inputting into the planning approval process or into community consultation activities. It would also be useful to have sustainability advisers or at least ‘champions’ who work in the design and procurement teams, as this would help ensure the approach is thoroughly embedded in these processes, for it is likely these employees have access to, or may themselves be, the key decision-makers in these areas. Having these sustainability advisers working across the different work streams would help achieve the integration and embedment of infrastructure sustainability that is so critical.

(f) **Undertaking a ‘Gap Analysis’**

It is also recommended based on the analysis of the two case studies that a ‘gap analysis’ of sustainability skills be undertaken at different stages of project delivery. At the very early stages, this may be undertaken by a sustainability employee working within the corporate arm of the proponent organisation, who may not necessarily work at the project-level but understands there is a need for project-level sustainability advisers. They could then go out to tender to engage some advisers specifically for the project, or advertise a sustainability manager or similar role for the project. The arrangement will depend on the scale of the project in question and governance mechanisms including delivery method, for example if it is a new organisation set up to deliver a project or an alliance. In any case, the advisers should somehow be embedded in the proponent organisation and project team as discussed above.

The gap analysis would need to be undertaken at intervals as the project starts to take shape, and once the sustainability objectives and targets are being formulated and prioritised, and initiatives developed. For example in ODA, the Head of Sustainable Development and Urban Regeneration looked for the ‘right’ people to fit the roles that were needed in terms of
different specialist areas to achieve sustainability outcomes.\footnote{See Part IV Section B(8).} Finding the right advisers to work in the proponent organisation could follow a similar process to that of choosing sustainability advisers as part of the selection of contractors. This was discussed in Section 6 above but also includes one-on-one interviews as outlined below.

\textbf{(g) A Sustainability Resource Plan}

A sustainability resource plan should be drawn up as part of the gap analysis, which is updated as the project progresses. Drawing up the plan would require an understanding of different project delivery processes and timeframes, as well as mapping out ‘what is going on, when, and who is responsible for what’.\footnote{See Part III Section B(8).} It should account for activities required as part of the approach to governing infrastructure sustainability such as on-going reporting and updating.

The plan should include i) hours to be spent per week on certain activities such as capacity building project team members on infrastructure sustainability (see Section 10 below), ii) a lay-out of the organisational structure for sustainability (see roles and responsibilities matrix discussion below), and iii) predicted recruitment needs and budgetary provisions (see the following Section 8). It should also predict resources needed to achieve a certain rating from a sustainability performance rating tool.

The plan would need to be constantly updated and flexible because, as discussed, little is known about the project at early stages of project delivery. Therefore, more or less resources for infrastructure sustainability may be required going forward. One activity that could be of use at the early stages of project delivery is undertaking research on similar projects to estimate the percentage of total project cost dedicated to infrastructure sustainability. This research could also support the nomination of infrastructure sustainability in the initial project budget submission to Treasury or equivalent, so that sustainability initiatives are not seen as an ‘add on’ to project cost later on.\footnote{This would probably only be possible for the ‘big ticket’ items that are not affected by intricacies of design and construction, for example the renewable energy in operations target and initiative for SMA.}
This sustainability resource plan would facilitate the sensible allocation of resources. For example as suggested in Section 6 above, there needs to be a plan in place regarding how much research is going into sustainability targets and initiatives at early design and planning stages, as well as into drawing ‘boundaries’ including assessment methodologies for procurement processes, leaving detail to be developed by the contractors. The resource plan would provide for this.

(h) Roles and Responsibilities Matrix

An interesting finding from the SMA case study is the possibility of having a roles and responsibilities matrix. This would have formalised the responsibility for sustainability objectives, targets and initiatives to individuals from each tier of management. In ODAT’s case, the SuMS provides some structure as to this allocation of responsibilities, but apparently not to the extent of such a matrix. Such a matrix is advisable and should be developed at early stages of project delivery. It should include not only roles and responsibilities of sustainability advisers, but also of other project employees and especially key decision-makers such as GMs, in terms of infrastructure sustainability and sustainability outcomes. It should also consider the prioritised or ‘material’ themes and targets, and assign responsibility for certain practice and outcomes to employees in different work-streams, so that those employees become part of the sustainability team and work on infrastructure sustainability perhaps one or two days per week, as discussed above.

The matrix should be linked to the development of sustainability-related key performance indicators that are embedded into employee contracts. These indicators would differ across the different work-streams and roles. They could include for a sustainability manager, for example, obtaining a high rating from a sustainability assessment rating tool. For a design manager, they could include achieving a certain reduction in GHG emissions through innovative design against a base case design. The key performance indicators could also be attached to some kind of rewards system – monetary or otherwise.

925 See Part III Section B(9).
(i) Seeking Sustainability Advisers with Desirable Attributes

In terms of personality traits or attributes of the sustainability advisers, experience on SMA in particular indicates that being tenacious and ‘thick-skinned’ is imperative, as well as being proactive in engaging with and capacity building different project team employees including the procurement team.\(^926\) Other qualities of importance particularly in the SMA case study included the ability to use appropriate and accessible language in expressing the infrastructure sustainability concept in order to get the project team ‘on board’.\(^927\) Such attributes were crucial for overcoming challenges presented by some of the SMA project employees as discussed in Part III Section B(8). Scanlon and Davis also discuss desirable attributes and qualities of sustainability advisers including being apt negotiators and conflict resolvers, and having the ability to build solid relationships.\(^928\) Undesirable attributes include being overly enthusiastic, as discussed by interviewee SL1 and Scanlon and Davis.\(^929\)

An important finding therefore is that individuals responsible for engaging sustainability advisers should seek these and other relevant attributes and qualities: whether it be for design, construction, operation or earlier stages of project delivery. This could be achieved through for example one-on-one interviews, which includes introductions with key decision-makers, as well as scenario-based questions. Also of importance will be carefully reviewing curriculum vitae, and providing sufficient and meaningful information in the role description including by specifying attributes and qualities along with necessary qualifications and experience.\(^930\)

Interestingly, desirable attributes were discussed more by SMA interviewees than ODAT interviewees. This may be attributed to limitations in the methodological design, for example when ODAT interviewees were questioned, the author did not lead the discussion toward this issue as she had done for SMA, simply because other issues seemed more pertinent at the time of the interview. Or perhaps the SMA interviewees saw the issue of desirable attributes as important, more so than the ODAT interviewees.

\(^926\) See Part III Section B(8).
\(^927\) See Part III Section B(9); Scanlon and Davis, above n 402, 128.
\(^928\) Ibid 127-30.
\(^929\) Ibid 127.
\(^930\) As discussed as important in the context of procuring a sustainability manager as part of the IMO in the SMA case study. See Part III Section B(6).
(j) Key Findings – Roles and Responsibilities

The extent of responsibility assigned for infrastructure sustainability within both ODAT and SMA was considerable, and a key feature of both organisational structures for sustainability was the leadership-level responsibility and accountability. Further, having one or more champions at the leadership-level is critical. This can be achieved through the sustainability advisers actively capacity building, seeking out and electing leadership-level champions. Ideally, all key decision-makers and other employees should have responsibility for infrastructure sustainability. Further, CEO level support should be sought where it does not already exist. Finally, having infrastructure sustainability as a separate work stream is important, provided there is sufficient integration and embedment across all project delivery processes and procedures.

Other key findings include the importance of having embedded sustainability advisers, and the critical role of sustainability advisers in guiding and capacity building the design team and other disciplines on infrastructure sustainability, including through holding workshops. It is also important to have, where possible, a multi-skilled sustainability advisory team that also comprises a governance specialist. Each individual should be embedded in various project delivery processes such as design where possible. A roles and responsibilities matrix should be developed to keep track of the different employees working within, or that have some interface with, the sustainability team.

Other key findings include the need for a relevant professional to undertake an on-going ‘gap analysis’ of skills and resources for infrastructure sustainability and sustainability outcomes. This would be supported by a sustainability resource plan that accounts for activities required as part of the approach to governing infrastructure sustainability such as on-going reporting. Drawing up the plan requires an understanding of different project delivery processes and timeframes. The plan should go ‘hand-in-hand’ with a roles and responsibilities matrix.

Further, both case studies revealed a number of desirable qualities and attributes for sustainability advisers including being tenacious. Those individuals involved in recruiting such employees should ensure they understand which sustainability advisory qualities and attributes would suit the project team and project in question, and actively seek such qualities and attributes.
8 Decision-Support Tools

(a) Overview

This section compares and contrasts the decision-support tools used by both SMA and ODAT in their respective approaches to governing infrastructure sustainability. Further, it explores the challenges faced in relation to these decision-support tools. Specifically, this section discusses the benefits and disadvantages associated with sustainability performance rating tools in their role as decision-support tools; the need undertake research to demonstrate the feasibility and value for money of certain initiatives; and limitations associated with data accuracy and availability. Following this analysis, key findings on what decision-support tools are vital for an approach to governing infrastructure sustainability are presented, as well as other key considerations for the framework in the next part.

(b) Benefits and Disadvantages of Sustainability Performance Rating Tools

In Section 6 above, some issues concerning the interface between CEEQUAL and other such tools and procurement processes were raised. This section goes into further detail about the constraints and advantages associated with CEEQUAL, and provides recommendations for its improvement – recommendations which are also applicable to AGIC’s tool as it continues to be developed. The analysis is based heavily on CEEQUAL given that the AGIC tool was not completed at the time the Sydney Metro project was ‘live’.

In Part IV Section B(9), the issue of whether CEEQUAL is capable of encouraging and achieving meaningful infrastructure sustainability and sustainability outcomes was discussed in the context of ODAT. Specifically, provisions in CEEQUAL were compared with ODAT’s sustainability commitments. It was found that generally CEEQUAL has been a good tool for ODAT to achieve sustainability commitments, despite the focus of CEEQUAL on environmental issues.

However, and as outlined above, a key observation of CEEQUAL is that it arguably comes too late in the process. This is despite it having different awards for different project stages
such as a design award, a construction award, or a combination, where some questions become scoped out if not relevant to a particular stage. Hence, CEEQUAL is limited in how it can influence the early stages of project delivery where decisions that have the greatest potential to impact on sustainability outcomes are made.

Another issue is the enormity of what CEEQUAL covers, and the tendency for it to be ‘laborious’ and ‘repetitive’ as discussed by interviewee OS. Hence, this begs the question is the amount of information in the assessment protocol actually necessary? Bosch and Pearce ask another important question in their review of sustainability guidance documents for buildings: ‘what is the best balance between the level of detail in guidance documents and the time constraints of their users?’ These questions should be explored further in the context of CEEQUAL and other sustainability performance rating tools in future research endeavours.

As a starting point however, building a prioritisation process into CEEQUAL and other tools would yield more targeted outputs and be less onerous. Such an approach would be in addition to existing scoping out provisions in the case of CEEQUAL. A prioritisation process would help identify which issues the proponent – and external stakeholders where the process includes them – considers most important. For example, by ranking the importance of a sustainability theme including objectives and possible outcomes, the proponent can ascertain which issues it has the most capacity to influence, and where it can yield the best outcomes, as well as where it should target its available resources. Interestingly, ODAT did prioritise the three key themes, but then required everything that came with CEEQUAL from its contractors.

Further, a prioritisation process might help reveal trade-offs. Trade-offs could be revealed because there is active investigation of infrastructure sustainability issues as they relate to the project, and further there is organisation of those issues from most to least pertinent or

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931 See Part IV Section B(6).
932 Vanegas above n 15, 5368; See Part I Section A and B.
933 See Part IV Section B(9).
935 See Part IV Section B(9).
936 See Part IV Section B(3).
937 See Part I Section A.
‘material’. The proponent and other stakeholders can determine which trade-offs are acceptable and which are not, and hence develop ‘rules’ about them. The current tools including CEEQUAL do not explicitly address trade-offs.

Benefits of CEEQUAL include that it rewards good process and is therefore non-prescriptive. In most cases it does not specify the targets or actual methodologies to be used. Hence, it encourages innovation in how the user – be it a designer, construction contractor or other – achieves good outcomes. It is necessarily concentrated on process unlike tools adopted in the building sector like Green Star, because infrastructure projects vary so significantly, for example in terms of type, scale, and materials used, that specifying anything would make the tool unusable for many projects. But rewarding good process is only appropriate where the tool user has a ‘handle’ on how to undertake that process to achieve good outcomes – that is if the tool user has access to relevant knowledge and has the required capability and capacity. What is missing from CEEQUAL therefore is encouragement to attain sustainability advisory services that provide such knowledge and capability early on in order to achieve good outcomes.

Even if it is a construction-only type award that is being sought, many plans and systems – for example a construction environmental management plan – are actually devised at earlier stages such as during planning approvals. So if there is no structured approach to infrastructure sustainability early on where objectives and targets can be embedded in such plans and systems, the attainment of a very high score or rating would be problematic.

As an example – and as relevant to Section 5 above on planning approval processes – in NSW the mitigation measures input into a construction environmental management plan are typically devised during the preparation of an environmental assessment report under the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act). The proponent can potentially input sustainability objectives into the construction environmental management plan through this process. The construction environmental management plan then guides contractors and is typically linked to a checklist and other monitoring activities,

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938 Kemp et al, above n 5, 16.
and probably to an EMS. It is here where there is an opportunity to embed sustainability objectives and even targets, for example in relation to a reduction in GHG emissions by using renewable energy generated on-site.

CEEQUAL does highlight the importance of such inter-linkages, for example in its Project Management Section where it highlights the importance of linking environmental commitments made at different delivery stages with design and construction activities. However, it does not provide explicit guidance on how to make those important connections.

An important conclusion is that tools can only take the user so far if they do not provide guidance for establishing an approach to governing infrastructure sustainability. And as discussed in Part IV Section B(9), CEEQUAL currently provides limited guidance on developing an approach to governing infrastructure sustainability, and further there is a considerable degree of compartmentalisation of key infrastructure sustainability governance provisions.

At the same time however, it is important not to expect too much from a sustainability performance rating tool. The key objective of such tools is to facilitate an assessment and rating as opposed to being guidelines in themselves. They may become far too onerous or prescriptive if they were to be specific about a certain approach or framework being used. This should not prevent the issuing of guidance – including in the form of referencing applicable frameworks – provided those frameworks are considered reputable and have been tested. Unfortunately, there is by no means an abundance of such approaches, a gap that this research and in particular the framework in Part VI aims to fill.

A key observation is that if the proponent has a strong governance approach for infrastructure sustainability and has a good understanding of the issues because it has engaged sound sustainability advisory services or has existing capacity, it will likely achieve a high score by default. However, it would be a good idea to be aware of the tool’s requirements and how to get a high score if getting a high score or rating, for example for marketing purposes, is on the proponent’s agenda.

\[940\] See Part IV Section B(9).
Another key limitation with CEEQUAL – which can in part be addressed by the proponent having a sound infrastructure sustainability governance approach – is a lack of provision for on-going monitoring and measuring to see if the score is warranted in the longer term. For example, whether objectives relating to long-term employment opportunities to be provided or facilitated by a project have been realised. If sustainability outcomes do not materialise this is an issue because infrastructure sustainability is inherently about the long-term. A proponent and its delivery partners may have all the best intentions in applying a tool, but lose momentum and focus once the project has been awarded. It is therefore recommended that a process for ongoing auditing of projects is built into sustainability performance rating tools.\footnote{Post construction review forms part of some building sustainability performance rating tools. For example the UK BREEAM tool where post construction review has been mandatory since 2008. See Energist, BREEAM Assessments Explained <www.energistuk.co.uk/sites/default/files/downloads/BREEAM.pdf> at 3 July 2011.}

Another observation in terms of improving on CEEQUAL is that it could include more specific questions on social sustainability performance – provided this does not result in the tool being more onerous. This is discussed in Part IV Section B(9). Further, the project management and governance theme could include a question on the preparation of resources to actually undertake an assessment. This would encourage the tool user to ensure they have adequate resources to undertake an assessment in advance. This may overcome issues associated with assessors being over-burdened or under-prepared to undertake an assessment.

As will be discussed in Part VII on conclusions and recommendations, further research should investigate the ability of tools such as CEEQUAL to actually deliver outstanding environmental, social and economic performance, through for example detailed case studies of projects in terms of the specifics involved, and long-term outcomes associated with, tool application.

\begin{itemize}
\item [(c)] The Need for Research Demonstrating Feasibility and Value for Money
\end{itemize}

Both case studies revealed that economic viability of achieving certain sustainability targets or implementing certain initiatives is a key consideration. Maintaining economic viability is key to ensuring ‘balance’ with the economic dimension of infrastructure sustainability. Put simply, if the project budget does not allow for a certain activity, it will be very difficult to
adopt. This makes robust analysis and research into the feasibility and cost benefit of certain initiatives extremely important. SMA undertook and presented such research predominantly through working and technical papers. 942 ODA also developed business cases for various initiatives, and tried to incorporate non-financial benefits to the greatest extent possible. Also of importance is using benchmarking exercises to compare costs between projects where such information is accessible.

In terms of cost, different types of sustainability initiatives can be separated into three categories, as discussed by interviewee OS2. 943 i) where initiatives are cost positive, in that they come at a premium, ii) where they are cost neutral, in that there is no difference in cost to adopting a business as usual approach, and iii) where there is a cost saving. Clearly the second and third categories are the most favourable and would require the least amount of convincing of key decision-makers. However, if whole-of-life costing considerations, as well as those benefits not typically costed by existing models, are duly taken into consideration, where initiatives sit across these three categories would vary considerably.

These cost categories are supported by Bargwanna who states that ‘many sustainable solutions are cost neutral or save on capital or operating expenses, and some initiatives can be funded through Research and Development grants’. 944 This makes whole-of-life costing – including through the articulation of policies and the application of methodologies – imperative to an approach to governing infrastructure sustainability. As demonstrated by ODA, valuing non-financial benefits may be difficult, but it should at least be a consideration. Finally – and as discussed by Bargwanna – there is a need to examine whether there is research and development or other funding available for an initiative, such as from government programs, or whether there is marketing or public relations budget available. 945

In addition to cost, the working and technical papers developed by SMA also examined the design and other feasibility aspects of the initiatives. Demonstrating feasibility is particularly critical in overcoming arguments against adopting an initiative based on restrictions

942 See Part III Section B(10).
943 See Part IV Section B(9).
944 Bargwanna, above n 24, 10. Research and development grants may be available through government organisations. For example in NSW, through the Department of Environment and Climate Change’s Sustainability Advantage Program. See above footnote 486.
945 Bargwanna, above n 24, 7.
associated with rail standardisation. Such restrictions may relate to, for example, inflexible safety standards. The degree of effort in researching each initiative will depend on the complexity of the initiative in question. Bargwanna states that:

Some sustainability ideas, such as purchasing green power, are relatively straightforward and can be implemented immediately. Others may require ongoing management and a dedicated team to investigate concepts, determine their feasibility, design products or processes and then evaluate success.

As experienced in the SMA case, undertaking benchmarking of similar projects to demonstrate the practicality of certain initiatives is an important part of these research activities. A SIR, as developed on the Sydney Metro project, will be an important tool to track the resources required for each initiative flagged for adoption on the project. These resource needs should then be outlined in the sustainability resource plan recommended above.

(d) Limitations in Data Accuracy and Availability

A lack of data availability, and the inaccuracy of data, was raised as a key challenge in the ODAT case study. In particular, access to meaningful and accurate carbon data was seen as an issue. This then has implications for the carbon footprint assessments undertaken including for Orient Way. This issue interfaces with the challenge of understanding the true sustainability of initiatives, which is discussed in Section 4 above. It also relates to the challenge of measuring sustainability outcomes. As discussed in Part IV Section B(10), even if an organisation has gained relatively accurate data on an issue such as GHG emissions in a carbon footprint assessment, unless that organisation can relate the assessment results – whether it be in tonnes of carbon of some other metric – to another project or at least meaningful targets – the information will not be overly useful. This makes it imperative to have a baseline or ‘business as usual’ reference that is separated into specific activities, such

946 See Part IV Section B(7).
947 Bargwanna, above n 24, 7.
948 See Part IV Section B(10).
as those relating to construction, against which the GHG outputs can be compared and reductions put in context.  

Methodologies and tools for measuring and obtaining data on issues such as carbon are increasingly being developed and refined. For example, ISO recently released ISO 50001:2011 Energy Management Systems – Requirements with Guidance for Use. During the early stages of implementing an approach to governing infrastructure sustainability, research should be undertaken on best practice methodologies, and these should be integrated where appropriate with the sustainability requirements as discussed above.

Further, to assist in reducing the carbon outputs of its projects, as well as to overcome issues associated with poor carbon data on products and services, ODAT researched and published a list of low carbon material options that contractors can procure. This lifts the burden from contractors to source low carbon materials themselves, which they may not have the knowledge or capacity to do, and provides a level playing field. However, the sustainability advisers must have adequate resources to develop such a list, as discussed above, and update it regularly to reflect changes in product and data availability.

(e) Key Findings – Decision-Support Tools

Key findings in relation to decision-support tools include that the project management and governance-related sustainability performance rating tool categories should reference guidance on how to actually establish an approach to governing infrastructure sustainability right from the start. For example, CEEQUAL could include more information on applicable governance frameworks on its websites. In any case, there should be more dialogue in the supporting information on the importance of setting up an infrastructure sustainability governance approach, and have it point to some examples where possible, such as the provisions of BS 8901.

CEEQUAL and other tools could also be improved by including a prioritisation process in order to achieve better ‘bang for buck’ and focused outcomes. A prioritisation process is integrated into the framework in the next part. Finally, a process for on-going monitoring of

949 See Part IV Section B(9).
950 Ibid.
Part V Section B

sustainability outcomes to ensure the project is actually achieving what it said it would achieve should be a part of any sustainability performance rating tool.

Other key findings include that economic viability is a vital consideration in the development of sustainability objectives, targets and initiatives. This makes robust analysis and research into the feasibility and cost benefit of certain initiatives extremely important. In evaluating cost, whole-of-life cost implications should be considered, as well as benefits not typically costed by existing economic models. Further, demonstrating feasibility through research activities including benchmarking is essential in ensuring initiatives are viable.

Finally, due to a lack of accurate data on different aspects of a project’s performance, for example in relation to carbon, research should be undertaken on best practice assessment methodologies. Methodologies should be integrated where appropriate with the sustainability requirements of contractors as discussed in Section 6 above. Such requirements could include a list of low carbon materials that contractors are required to use when procuring products.

9 Measuring, Monitoring and Reporting

(a) Overview

This section compares and contrasts the case study approaches in terms of measuring, monitoring and reporting. Specifically, it discusses techniques for both reporting and tracking progress toward targets, and communicating to external stakeholders. SMA’s approach to measuring, monitoring and reporting was in its infancy when the project was deferred. However, ODAT has established processes in place for measuring, monitoring and reporting that provides some valuable lessons for the development of the framework presented in Part VI.

(b) Reporting and Tracking Progress Toward Targets

SMA planned to develop a process for tracking progress toward sustainability targets at different project delivery stages such as detailed design and construction. This would have helped ensure that any commitments made by contractors during the procurement stage could
be tracked and ‘ticked off’, with decision-making made transparent.951 It would also have helped ensure that SMA and the successful consortia were complying with any sustainability-related conditions of approval resulting from the SoCs as part of the planning approval process.

SMA’s process was also to include revision and updating of sustainability targets to reflect legislative and other changes to drive continuous improvement.952 The tracking of progress toward targets would have been facilitated through relevant indicators, consistent with AGIC’s tool, which would have been incorporated into the relevant SIRs. Other indicators of relevance may have been adopted from GRI.953

ODAT achieves its tracking process through various means, including through reporting mechanisms. Reporting is undertaken on an annual basis through the London 2012 Sustainability Plan Progress Report Card, which is reviewed by the Commission for a Sustainable London 2012.954 Further, monthly reporting on a web-based system is required with a cross-cutting theme of sustainability.955 Finally, ODAT produces Quarterly Transport Sustainability Reports which address the three headline themes of inclusion, healthy living and climate change. These reporting mechanisms provide incentives for different parties to deliver on ODAT’s sustainability commitments including through the allocation of red, amber and green ‘lights’ on performance.956 A ‘red light’ performance is unfavourable due to various reasons including potential financial implications.

Such reporting requirements are linked to ODAT’s SuMS and form part of the overall compliance with the objectives of the framework. The SuMS itself is then assured through programd sustainability audits and second part assurance.957 Further, management-level reviews of the SuMS are undertaken and ensure that appropriate actions are recommended to address any issues.958 The SuMS has the added benefit of being linked to verification and auditing processes inherent in the requirements to meet BS 8901. Therefore, obtaining

951 See Part III Section B(11).
952 Ibid.
953 Ibid.
954 See Part IV Section B(10).
955 Ibid.
956 Ibid.
957 Ibid.
958 Ibid.
resources from the leadership functions of ODAT or ODA to ensure ongoing measuring and monitoring of sustainability progress would not have been difficult. Another important form of assurance for the overall London 2012 sustainability program is provided by the Commission for a Sustainable London 2012, discussed further in the proceeding section.

ODAT’s approach to monitoring, measuring and reporting is therefore robust. By constantly monitoring its own and its contractors’ performance, it is possible to gain information on which sustainability targets and initiatives are proving difficult to achieve or implement, which can be improved upon, and which need to be altered in order to meet the sustainability commitments. This also enables lessons learnt to be developed for other projects and for industry at large. Combining this approach with SMA’s SIR format would be particularly favourable. The SIR provides a means to track the ongoing development and implementation of sustainability targets and initiatives for the life of the project. It appears that ODA does have a SIR of sorts, as discussed in Part IV Section B(5), linked where relevant to conditions of consent. However, it does not appear that ODAT has developed or implemented a SIR.

The structured approach to monitoring and assurance presented by BS 8901 would not have been available to SMA given the lack of a similar standard in NSW. However, the specific provisions including internal audits and seeking external assurance, through for example external auditors, could still have been adopted. Further, the action plans that are developed to address any issues would also help ensure ongoing compliance with an approach. Key recommendations from the implementation of BS 8901 – including arranging programmed internal audits, external verification provided through audits (such as through a sustainability consultancy independent to the project or a non-government organisation), and developing action plans to address issues linked to responsibilities – are considered in the development of the framework in Part VI.

(c) Communicating to External Stakeholders

ODA and ODAT have also been active in communicating to external stakeholders. This is evident in the extent of sustainability-related documents available on the London 2012 website, and the annual reports produced by the Commission for a Sustainable London

\[959\] As identified as part of the roles and responsibilities matrix. See above Section 7.
The provision of such documents on the website is a good means of communication. Further, the open access to information provided to the Commission indicates a commitment to stakeholder communication and inclusion, also evident in the information (including in the form of non-publicly available documents) provided by interviewees as part of this research.

ODA’s communications team is used to communicate on sustainability performance to the community. This would have encouraged ownership and understanding of the sustainability agenda by the communication discipline employees. Further, using the specific skill sets of such employees in terms of being able to translate and communicate potentially complex and technical sustainability issues into accessible terms would be extremely beneficial.

The form of communicating to external stakeholders on infrastructure sustainability and the Sydney Metro project had not been devised at the time of the project’s deferral. However, as discussed above, SMA was planning to report to external stakeholders on an annual basis through the GRI reporting protocol.

(d) Key Findings – Measuring, Monitoring and Reporting

ODAT’s approach to monitoring and tracking progress toward sustainability targets in particular provides useful guidance for the development of the framework in Part VI. In addition to the array of reports required to London 2012 and ODA, ODAT is committed to assurance and seeks internal and external verification of its SuMS. Combining this system with SMA’s SIR approach, including ensuring compliance with relevant sustainability performance rating tool indicators and/or GRI indicators, is a key recommendation for Part VI.

ODA and by default ODAT’s approach of using the communications team to interface with community stakeholders is favourable in translating potentially complex sustainability concepts into accessible terms. Further, having sustainability-related information available on the project website is a good avenue of communication.

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960 See Part IV Section B(10).
Part V Section B

10 Knowledge Sharing and Capacity Building

(a) Overview

This section compares and contrasts the case study approaches to knowledge sharing and capacity building. It describes two aspects of knowledge sharing based on the case studies, and discusses the importance of creating a culture for sustainability. It also outlines capacity building techniques based on the case studies.

It is acknowledged that analysis of knowledge sharing and capacity building based on the SMA case study is limited. This is because at the time of the project’s deferment, there was still a temporary workforce, and hence resources were not invested in official capacity building of these employees on infrastructure sustainability. However, capacity building did happen more organically, for example through the weekly design meetings where sustainability was discussed, and through the active role played by the sustainability advisers including in informing and educating the procurement team on what was possible in terms of infrastructure sustainability. ODAT provides better insight into knowledge sharing and capacity building activities, and as such is analysed in greater depth in this section.

(b) Two Aspects of Knowledge Sharing

The ODAT case study reveals two main components of knowledge sharing. There is the knowledge sharing that happens on a project amongst different work-streams and internal project stakeholders as discussed by Shen et al., and with contractors and other delivery partners. This can also be termed internal collaboration, participation and engagement. This internal collaboration can help advance infrastructure sustainability including through promoting ‘systems’ or multi-disciplinary thinking. Such thinking allows for different expertise to be brought ‘to the table’ in the development and application of sustainability initiatives, and in solving complex sustainability issues.
There is then the knowledge sharing that takes place from project to project, or project to industry, through for example regular participation in related events as undertaken by ODA and ODAT.\(^{966}\) ODA took this latter form of knowledge sharing very seriously, as stated in its Sustainable Development Strategy.\(^{967}\) Sharing across projects can take place when employees move on from a project and take ‘lessons learnt’ from undertaking infrastructure sustainability. It is important to utilise this experience at the early stages of developing sustainability objectives, targets and initiatives to help ensure they are viable and to predict any problems that might arise. A workshop is a good way to undertake lessons learnt exercises.\(^{968}\)

Speaking about lessons learnt on projects in general, Kagioglou et al state that the ‘fragmented and competitive nature of the construction industry prevents the benefits of shared best practice from being utilised’.\(^{969}\) They propose a process protocol for the creation, maintenance and use of a legacy archive which acts as a central repository or information spine for the information and experience generated throughout the delivery of a project. ODAT has also been active in capturing lessons learnt on its projects including Orient Way.\(^{970}\) Taking these approaches into consideration, the framework for governing infrastructure sustainability in Part VI includes a process for capturing lessons learnt and experience from other projects, namely in a workshop environment, and for the project in question so that lessons learnt can be taken to other projects and industry at large in legacy.

(c) Creating a Culture of Sustainability

Some ideas for creating a sustainability culture were being developed by SMA including participating in an employee capacity building government program.\(^{971}\) In the case of ODAT, a sustainability culture is nurtured through the Learning and Development Programme. In both cases, leadership-level appetite and commitment to infrastructure sustainability was and has been important in gaining support from other project team members.

\(^{966}\) See Part IV Section B(11).
\(^{967}\) Ibid.
\(^{968}\) Scanlon and Davis, above n 402, 130.
\(^{969}\) Kagioglou et al, above n 735, 148.
\(^{970}\) See Part IV Section B(11).
\(^{971}\) See Part III Section B(12).
The notion of ‘culture’ in the context of sustainability has been reported on extensively in the literature, mainly in the area of corporate or organisational responsibility and sustainability. For example, the research area of ‘green culture change’ focuses on how organisations embrace environmentally responsible values, beliefs and behaviours. The need to change corporate culture in order to achieve more sustainable practices is discussed by numerous commentators including Dunphy et al, Benn et al, and Johnson and Walck. Building a culture of sustainability is intrinsically linked to organisational change management activities.

There can be little doubt that it is difficult to change the inherently conservative culture that exists within organisations associated with the infrastructure industry, and more specifically within construction companies and within the urban rail sector. It may be even more difficult than for companies operating in different industries and sectors such as in manufacturing, mining and forestry, where much of the research into corporate sustainability and change management has its roots. An important area for further research is the exploration of effective cultural change strategies and activities in the urban rail sector specifically, but also in the context of construction companies operating in the infrastructure space more broadly.

In some of the literature, leadership-level support is viewed as critical in changing organisational culture for sustainability. This notion is certainly supported by the two case studies, as discussed in Part III Section A(5) and Part IV Section A(4). Within the literature, less focus appears to be on the importance of a ‘bottom up’ approach to cultural change, whereby less senior employees drive organisational change for sustainability.

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975 See Part IV Section B(7).

976 See for example Johnson and Walck, above n 973, 34 and 37.
Part V Section B

However, this has more recently been discussed in terms of the influence of ‘Gen Y’ – or the idea that the younger generation has greater expectations and desire for sustainability outcomes than older generations. This is the basic premise underpinning a Michigan State University and Deloitte publication titled Gen Y + Sustainability, which states in its opening paragraphs that ‘going green is a constant underlying tone for Generation Y’. 977

The importance of non leadership-level employee appetite in driving an infrastructure sustainability agenda was identified as part of the SMA case study in Part III Section A(5). In essence, it is important that the ‘top down’ or leadership-level drive for infrastructure sustainability meets with the ‘bottom up’ drive from non leadership-level employees. This dynamic also warrants further exploration in the context of the urban rail sector, and the infrastructure industry more broadly.

The creation of a culture of sustainability has implications for legacy outcomes, the concept of which is discussed further below in the context of the case studies. Bargwanna states that ‘improved awareness and cultural change in the workplace transfers to the community and many projects leave legacies including a positive influence on host organisations’. 978

(d) Capacity Building Techniques

The case studies indicate that capacity building of internal and external stakeholders can be done intentionally, and/or can occur by default through experience gained ‘on the job’. Capacity building was an important role of the sustainability advisers as discussed above in Section 7. Specific capacity building activities and techniques included incentive schemes as were used for Orient Way, 979 and workshops. Also of importance is the use of a variety of media to engage with employees in relation to infrastructure sustainability commitments, including through e-learning materials as used by ODA and ODAT. 980

In terms of experience gained ‘on the job’, the experience that contractors and ODAT employees gained from applying CEEQUAL will no doubt be transferable to other projects.

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978 Bargwanna, above n 24, 10.
979 See Part IV Section B(11).
980 Ibid.
ODA and ODAT are also increasing the capacity of industry at large to adopt infrastructure sustainability. This is mainly due to the scale, high-profile, and transformational nature of the Games’ infrastructure – involving a large proportion of the UK infrastructure sector either directly or indirectly. ODA and ODAT have also been active in contributing experience and ideas to the ongoing development of sustainability performance rating tools including CEEQUAL and the UK Building Research Establishment Environmental Assessment Method (BREEAM).  

ODA and ODAT’s strong and on-going commitment to sustainability outcomes has set a benchmark for infrastructure sustainability at an international scale. As Whittaker et al state:

> ODA has set robust performance measures, which will set new standards for the sustainable construction of the venues, facilities, infrastructure and transport used for the London 2012 Games that will undoubtedly translate into wider specification across the industry. The success of ... ODA efforts to work in partnership with stakeholders, to encourage industry to embrace the sustainability objectives and think innovatively will ultimately see the transfer of this capability more widely throughout the market.

However, it is the strong commitment to knowledge sharing that will allow this benchmark to move forward in subsequent years.

(e) Key Findings – Knowledge Sharing and Capacity Building

There are two aspects of knowledge sharing. The first is knowledge sharing within a project, and the second is from project to project and to industry at large. This should be formalised through a process for capturing lessons learnt, both from other projects to the project in question, and then from the project in question to other projects and to industry at large. Building a culture of sustainability is also important and links in with the concept of legacy. Finally, the case studies indicate that capacity building of internal and external stakeholders can be done actively such as through workshops, and can occur by default through experience gained ‘on the job’.

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981 Ibid.
982 Whittaker et al, above n 206, 25.
11 Legacy

(a) Legacy and Infrastructure Sustainability

Achieving legacy outcomes is a key driver and deliverable for the Games, including ODAT’s transport program. It relates to the physical infrastructure and its utility into the future, to the transfer of skills, knowledge and capability, and to moving the benchmark of infrastructure sustainability and sustainability outcomes forward. The concept is being translated down to the project-level by ODAT, as evident on Orient Way where environmental sustainability initiatives were driven by legacy thinking of ‘what could be left behind’.\(^{983}\) This concept was so entrenched in ODAT’s project delivery activities that it was reflected in contract documentation.\(^{984}\)

This concept may not have been articulated in the case of SMA, but SMA has contributed legacy outcomes including through participation in this research. Also, the approach adopted particularly in the sustainability requirements for the IMO and PRI contracts is being considered in the development of RFP documentation and contracts for other projects being delivered by Transport NSW, RailCorp and the NSW Transport Construction Authority.\(^{985}\)

It is suggested that legacy is implicit in the concept of infrastructure sustainability, and indeed sustainability more broadly, because it is about the longer term. The benefit of the term ‘legacy’ is that it is perhaps more accessible to a broader audience than ‘sustainability’, although this would need to be confirmed through research. Ambiguities associated with the sustainability concept are discussed by commentators including Robinson, Connelly and Jacobs.\(^{986}\)

\(^{983}\) See Part IV Section B(12).
\(^{984}\) See Part IV Section B(6).
\(^{985}\) Interviewee SS2.
Part V Section C

(b) Key Findings – Legacy

The concept of legacy relates to the physical infrastructure and its utility into the future, to the transfer of skills, knowledge and capability, and to moving the benchmark of infrastructure sustainability and sustainability outcomes forward. Legacy is clearly linked to the concept of sustainability, but is perhaps a more tangible term, which would need to be confirmed through further research.

C Conclusion

Sections A and B of this Part compared and contrasted both the drivers for addressing and governing infrastructure sustainability, and the key components of each case study approach. The analysis was supported by relevant literature. The key findings were summarised under each section. These key findings are used in the development of the framework for governing infrastructure sustainability presented in the next part.

That both SMA and ODAT applied similar processes and developed similar components to their governance approaches is compelling evidence that the theory developed in this Part, and subsequently the framework presented in Part VI, is of relevance and has a good chance of being applicable to other urban rail infrastructure projects, and potentially projects from other sectors. What is even more compelling is that SMA and ODAT developed such similar infrastructure sustainability governance features and components independently of each other. This is discussed further in Part VI Section A.
VI A FRAMEWORK FOR GOVERNING INFRASTRUCTURE SUSTAINABILITY

A Overview

Part V undertook a comparative study of the two case study approaches to governing infrastructure sustainability and then presented key findings. The most effective components and features of each case study approach were identified, and the approaches discussed, challenged and improvements suggested based on existing theory found in the literature.

This Part presents a framework for governing infrastructure sustainability. It is based on the theory developed in the preceding sections. Specifically, it adapts the key findings for each section of the comparative study into five stages comprising a number of steps for developing and implementing an approach to governing infrastructure sustainability. The framework comprises a novel approach to governing infrastructure sustainability that builds and improves upon each case study approach.

These stages and steps describe activities and processes that should enable effective governance of infrastructure sustainability, based on analysis of the two case study approaches. Each stage and step also lists the key activities and deliverables, as well as the expected outcomes and benefits. Some of the framework stages and steps do not take place in a linear fashion. The relationships between the various stages and steps, as well as where they sit in terms of the overall project delivery phase, are illustrated in Figure 10.

The framework is based on a number of assumptions. The first assumption is that drivers exist for the proponent organisation to adopt an infrastructure sustainability agenda, and hence there is an opportunity to apply the framework. Such drivers would include those outlined in Part III Section A and Part IV Section A. The second assumption is that the framework would be applied by sustainability advisers or other relevant professionals987 so that such individuals have already been engaged and embedded as part of the project team.

987 Such professionals would need to have an understanding of infrastructure sustainability, and may include but not be limited to environment and planning discipline employees.
The framework can also be used to support a bid for sustainability work on an infrastructure project. This is particularly useful given the increasing sustainability requirements now appearing in infrastructure delivery-related request for proposal (RFP) documentation, as discussed in Part III Section B(6). The framework can assist in formulating a response to such requirements. Thirdly, it is assumed that these advisers have been engaged at the early stages of project delivery, namely at early planning and design stages, prior to planning approval and procurement, and detailed design (Figure 1). Finally, a relatively high level of experience and competency of the sustainability advisers is assumed, although the framework will assist less experienced advisers, and help build their skills and competencies.

It is acknowledged that it is certainly possible that similar urban rail infrastructure projects may achieve sustainability outcomes without adopting the governance approaches used in the two case studies, and hence the framework presented here. Therefore, this framework is not a blueprint for every possible urban rail infrastructure project – or infrastructure project more broadly – in the world, but it suggests a highly promising approach for encouraging infrastructure sustainability and achieving sustainability outcomes. It is particularly promising and compelling because both of the case study organisations adopted very similar mechanisms to achieve sustainability outcomes, with some variation as discussed in Part V. What is even more compelling is that both the Sydney Metro Authority (SMA) and the Olympic Delivery Authority (transport division) (ODAT) independently developed a similar approach without – as far as the author is aware – reference to each other.

So while the framework presented here is not prescriptive, it should be considered on other projects of a similar scale and which have – amongst their basic drivers – the notion of addressing infrastructure sustainability and achieving sustainability outcomes. The framework should also be tested on other urban rail infrastructure projects – and potentially other infrastructure projects from other sectors – to further enhance its applicability at a broader scale. Ideally, this ‘testing’ should be undertaken through academic research that is grounded in the realities of real-life infrastructure projects. This is discussed further in Part VII.
B Framework Stages and Steps

Figure 10 below outlines the five framework stages and their respective steps. In summary, Stage One largely involves preparatory work by the sustainability advisers and the proponent staff or project team at the early stages of project delivery. As the project progresses, the stages integrate and interface with key activities including in relation to design and procurement. At Stage Four, the governance approach is well established, has feedback loops across the key components, and is ready to be handed over for the operational phase of the facility.

**Figure 10** – Overview of the framework for governing infrastructure sustainability

1 Stage One – Research, Engagement and Workshops

(a) Step 1 – Organisation and Project-specifics Research

The first step in Stage One sets preparations within the proponent organisation. The sustainability advisers are engaged on the project at this point, and would be embedded
within the project team,\(^{988}\) so that they are not seen as ‘outsiders’.\(^{989}\) In this step, the advisers become familiar with the project team organisational structure, as well as project-specifics such as delivery method, proposed project program, budgetary conditions and regulatory environment. This would include spending time reviewing relevant project documentation and talking to various project team members, especially key discipline or work stream leaders such as design. It would also include gauging existing drivers for infrastructure sustainability, as well as any existing project commitments to sustainability outcomes, for example based on the original business case or project funding submission to Treasury or equivalent (that generally would happen at the project development phase as per Figure 1).\(^{990}\) Drivers can be used to encourage the adoption of infrastructure sustainability.

It is also important for the advisers to undertake preliminary mapping of what is going on, when, and who is responsible for what. This will help highlight ‘points of entry’ for embedding and integrating infrastructure sustainability with other project delivery processes. It will also assist in identifying the key decision-makers. This mapping exercise could be undertaken and presented in various ways including via a ‘mind map’.\(^{991}\)

Finally, the advisers should develop a preliminary gap analysis\(^{992}\) of sustainability skills accompanied by an initial sustainability resource plan that will be continually updated, but which predicts recruitment and training needs, budgetary provisions, hours to be spent per week on sustainability activities, and a lay-out of the organisational structure for sustainability.\(^{993}\)

The key activities and deliverables of Stage One Step 1 are therefore:

- Research into project and organisational-specifics.

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\(^{988}\) At this stage, the project team will likely comprise those individuals or employees working within the proponent organisation, or within the alliance if the project is being delivered under such a contract type.

\(^{989}\) See Part V Section B(7).

\(^{990}\) Typically the business case for a project will include sustainability-related values or vision which need to be driven or achieved through project delivery. See for example interviewee SL2 statement in Part III Section A(4) who states that ‘... sustainability doesn’t happen unless you drive it’.

\(^{991}\) A mind map is a diagrammatical representation of tasks, ideas or other items. Mind maps are used to used to generate, visualize, structure, and classify ideas, and as an aid to studying and organising information, solving problems, making decisions, and writing. Tony Buzan and Barry Buzan, The Mind Map Book (BBC Active, 2006), 3.

\(^{992}\) An initial ‘gap analysis’ may already have been developed by the proponent’s corporate sustainability employee and may be why advisers have been engaged in the first instance. However, this cannot be assumed.

\(^{993}\) See Part V Section B(7).
• Mapping out what is going on, and out, and who is responsible for what.
• A preliminary ‘gap analysis’.
• A sustainability resource plan.

The expected outcomes and benefits are:
• Advisers have an understanding of project and organisational-specifics, and an appreciation of organisational structure including key decision-makers.
• Advisers have an understanding of predicted timing for key project delivery stages and activities.
• Advisers are starting to engage and become familiar with other project team employees (but see also Step 2 below).
• The project team is starting to learn about infrastructure sustainability and about the associated governance approach.

(b) Step 2 – Engagement and Consultation Activities

The second step of Stage One is for the sustainability advisers to undertake a number of engagement and consultation activities. This includes one-on-one consultations and engagement with other project team members, and where possible and appropriate, external stakeholders. External stakeholders of relevance may include, but not be limited to: regulators, community groups and other interested parties. Ideas and knowledge can be gained from such external engagement, and community acceptance for the project can be built based in part on the proponent’s infrastructure sustainability commitments.994

In terms of internal engagement, encouraging an understanding and ownership of infrastructure sustainability and sustainability outcomes by all project team members is critical. Disciplines of particular importance to be targeted include design, procurement and planning, as Stage Three includes close interactions with the related project delivery processes. Focus should also be on building sound relationships with the leadership-level of the organisation including the Chief Executive Officer (CEO).995 The roles and responsibilities of other project team members, as well as individual appetite for

994 See Part I Section A.
995 See Part V Section B(7).
infrastructure sustainability and sustainability outcomes, should be understood in order for subsequent training and engagement efforts to be targeted. Also, existing infrastructure sustainability-related skills and capacity should be documented for input into the gap analysis and sustainability resource plan (Stage One Step 1). Most of these engagement activities are continuous and operate in on-going parallel to other stages and steps.

The key activities and deliverables of Stage One Step 2 are therefore:

- Advisers document existing skills and capacity in infrastructure sustainability, and input into sustainability resource plan.
- One-on-one engagements with project team members and relationship building.
- Engagement with external stakeholders as appropriate.

The expected outcomes and benefits are:

- Understanding of project team roles and responsibilities.
- Relationships built with leadership-level (and other) employees.

(c) Step 3 – Documenting Preliminary Sustainability Objectives, Targets and Initiatives

In Stage One Step 3, the sustainability advisers undertake preliminary research into possible objectives, targets and initiatives that address infrastructure sustainability (for example relating to resource use, biodiversity and people and place).\(^996\) This activity will be restricted by not knowing a lot of detail about the shape and form of the project, as discussed in Part V Section B(3). However, those targets and initiatives that either link in with project commitments already made as discussed in Step 1 above, or are not dependent on specific project details such as using renewable energy during operations, can be explored and formulated at these early stages.

Developing this preliminary set of sustainability objectives, targets and initiatives should be informed by a benchmarking exercise of similar projects at an international scale.\(^997\) This will help demonstrate feasibility. Further, preliminary investigations and research into value for money, and the overall value proposition of the proposed preliminary sustainability

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\(^996\) See themes in Part V Section B(3).
\(^997\) See Part V Section B(3).
objectives, targets and initiatives should be undertaken at this point. This should include consideration of whole-of-life cost implications. This preliminary set of sustainability objectives, targets and initiatives should be placed into a draft Sustainability Initiatives Register (SIR), and a simple spreadsheet format will suffice which links each objective, target or initiative to reference documents such as benchmarking studies. The draft SIR should also list potential indicators through which to measure progress later on (see Stage Four Step 1 below). The SIR can then be used to inform the workshop (Step 4) below.

The key activities and deliverables of Stage One Step 3 are therefore:

- Research into preliminary sustainability objectives, targets and initiatives including through a benchmarking exercise.
- Develop draft SIR including potential indicators.

The expected outcomes and benefits are:

- Advisers are informed about possible sustainability objectives, targets and initiatives.
- Feasibility of sustainability objectives, targets and initiatives can start to be demonstrated.
- Valuable comparisons with other similar projects are possible.

(d) Step 4 – Workshop

The sustainability advisers should conduct a workshop which comprises representatives from all of the disciplines or work stream (ideally the directors or other leadership-level employees). The aims of the workshop are i) to bring the project team together to discuss infrastructure sustainability issues, ii) help to build the knowledge and understanding of the workshop participants, iii) determine the most relevant sustainability themes or issues for the project, iv) capture lessons learnt and facilitate knowledge sharing, and iv) identify appropriate champions for different sustainability themes or issues.

In the workshop, the advisers facilitate discussion on the meaning of infrastructure sustainability in terms of the project in question. This would be assisted by the research undertaken in Steps 1 and 2 above. The infrastructure sustainability concept can be explained.

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998 See Part V Section B(8).
through the separation of the concept into the seven themes discussed in Part I Section A(2) and Part V Section B(3) of:

1. Project management and governance.
2. Resource use.
3. Emissions.
4. Biodiversity.
5. Infrastructure resilience.
7. People and place.

Specific examples of how each theme relates to the project would need to be provided. For example, potential climate change impacts and implications for the project should be raised with respect to the infrastructure resilience theme. It should be explained to workshop participants that the project management and governance theme will be covered by the approach that is being developed through the application of this framework. Also, the concept of legacy should be used to encourage an understanding of the infrastructure sustainability concept because, simply put, it is about what is going to be left behind for future generations for optimal benefits and reduced adverse effects.

Following this presentation and discussion on the meaning of infrastructure sustainability, a prioritisation process should be undertaken. This process would involve examining and discussing the different themes and their components, and determining which are the most ‘material’ or relevant to the project in question.\textsuperscript{999} This can be achieved through a materiality quadrant which has on one axis ‘influence’ and on the other axis ‘impact’ (Figure 11). This is a qualitative assessment where the highest influence and impact themes or specific theme components are given a high priority or materiality rating. This process must involve active participation and input from the workshop participants. This prioritisation process is more formal than was the case for SMA and ODAT. However, as discussed in Part V Section B(3), other tools or methods including some form of multi-criteria decision analysis or risk assessment may be appropriate in facilitating the prioritisation process. The advisers should

\textsuperscript{999} This is the approach being promoted by GRI. The importance of prioritisation is also discussed in Part V Section B(3).
use discretion as to which tool or method is appropriate based on factors such as their familiarity and expertise in their application.

**Figure 11 – Materiality quadrant**

This prioritisation process will not only help to inform the sustainability policy and position for the project, but general discussions taking place during the workshop will also be of value, and key ideas or perspectives raised should be documented for further consideration by the advisers. Because there will very likely be conflicts of interest or at least different perspectives arising during the workshops, advisers should be constantly aware of their role as negotiators and facilitators.\(^{1001}\)

Following the prioritisation process, a lessons learnt and knowledge sharing exercise should be undertaken.\(^{1002}\) This will give workshop participants the opportunity to understand existing skills with respect to infrastructure sustainability. It will also give the advisers the opportunity

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1001 See Part V Section B(7); Scanlon and Davis, above n 402, 130.

1002 See Part V Section B(10).
to identify appropriate champions for certain themes, or specific sustainability objectives, targets and initiatives, as they are further refined. These champions can form the overall multi-disciplinary sustainability team, except where extra resources or technical skills are needed for technical aspects of sustainability such as greenhouse gas (GHG) assessments. If the workshop participants are too ‘senior’ to be an active member of the sustainability team, they could elect an individual from their own work stream. However, leadership-level employees should still be elected as champions where possible.

The key activities and deliverables for Stage One Step 4 relate primarily to undertaking a workshop:

- Presentation on meaning of infrastructure sustainability.
- Prioritisation process resulting in ‘material’ themes and theme components.
- Documenting key ideas and perspectives.
- Lessons learnt and knowledge sharing exercise including to identify appropriate champions for each theme.

The expected outcomes and benefits are:

- Consensus reached on ‘material’ themes and theme components.
- Resources can be targeted on specific themes and theme components.
- Workshop participant ‘buy-in’ and ownership.
- Capacity building of workshop participants and project team.
- Starting to form multi-disciplinary sustainability team from which advisers can draw.

2 Stage Two – Overall Structure and Key Components

(a) Step 1 – Further Research on Sustainability Objectives, Targets and Initiatives

Step 1 of Stage Two comprises the sustainability advisers further articulating the sustainability objectives, targets (and potentially initiatives pending the level of detail known about the project and the nature of the initiative in question) based on the outcomes of Steps 1 to 4 in Stage One including workshop outcomes. The SIR should be further developed in this step, and a list of sustainability objectives and targets (and potentially initiatives) should be

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1003 This was the approach adopted by ODA. See Part VI Section B(9).
negotiated with the leadership-level to be inserted into the sustainability policy and plan or strategy as discussed in Step 2 below.

The sustainability objectives and targets should cover all the material themes identified in Stage One Step 4. They should also reflect any project commitments or ‘inherited’ sustainability objectives and targets.\textsuperscript{1004} The targets should not be specific where not enough information is known about the project; and where there is an advantage in going out to the market through procurement processes in order to develop specific targets.\textsuperscript{1005} Because this step takes place at early stages of project delivery where conceptual design or equivalent is taking place, the advisers can work with the designers in formulating suitable sustainability objectives, targets and even initiatives in the SIR. Engaging with external stakeholders such as construction industry associations\textsuperscript{1006} and the community\textsuperscript{1007} may also be appropriate in this step, as well as considering requirements of relevant sustainability performance rating tools for ease of a rating assessment at later stages. Finally, further research (in the form of working papers) into feasibility and value for money will be essential during this step; and cost benefit analyses, business cases or equivalent may need to be developed.\textsuperscript{1008} Feasibility criteria should include as a minimum: maintainability, durability, implications for safety, market availability and whole-of-life costing.

The key activities and deliverables of Stage Two Step 1 are therefore:

- Further research including feasibility studies of potential targets and initiatives.
- List of sustainability objectives and targets to be inserted into sustainability policy and plan or strategy.
- Further development of SIR.
- External stakeholder engagement where appropriate to inform development of targets and initiatives.

The expected outcomes and benefits are:

- Ensuring practicality of targets and initiatives.

\textsuperscript{1004} See Part V Section B(3).
\textsuperscript{1005} See Part V Section B(6).
\textsuperscript{1006} Ibid.
\textsuperscript{1007} Ibid.
\textsuperscript{1008} For example, undertaking surveys of end users of a station would contribute to developing specific initiatives.
\textsuperscript{1009} See Part V Section B(8).
• Instilling positive community and stakeholder interest in the project.
• Sustainability advisers are prepared for developing the sustainability policy, and plan or strategy.

(b) Step 2 – Developing the Policy, and Strategy or Plan

Step 2 of Stage Two involves the development of a policy position on each ‘material’ theme which would include the sustainability objectives, and where appropriate specific targets, developed in Step 1 above. The policy positions would be informed by the research undertaken including on feasibility and value for money, as well as the prioritisation process as part of Stage One Step 4 above. These policy positions then inform the development of a sustainability policy and sustainability plan or strategy for the project.

The sustainability policy would summarise the objective and target commitments, although most targets would not be written into the policy to avoid a high level of prescription and inflexibility. The policy requires sign off by the CEO and should be developed in consultation with the project team and external stakeholders as appropriate. Once developed, it needs to be filtered throughout all work streams including via one-on-one or small group consultations on the imperatives of the policy and how it relates to the day-to-day work of every project team member.

The plan or strategy would then accompany the policy, providing detail on how the policy commitments will be met. Key components of the plan or strategy should include:
• The sustainability objectives and any targets for each theme.
• Strategies (and even possible initiatives) for reaching those sustainability objectives and targets, for example through sustainability in design meetings.
• The interfaces and relationships of different provisions in the plan or strategy to various project delivery processes including those pertaining to design, procurement and planning approval. This would be assisted by the mapping process included in Step 1 above. These interfaces can be presented in a table outlining each policy commitment, and the related work stream plan or activity. For example, provisions in the EMS can be linked to biodiversity theme objectives. Table 5 below provides indicative examples of such linkages. In this way, any unnecessary ‘doubling up’ of activity is avoided. It also helps to highlight the integrated nature of the approach to governing infrastructure sustainability.
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- A roles and responsibilities matrix\textsuperscript{1009} which highlights any champions elected in Stage One and the responsibility of each leadership-level employee. It should allude to any key performance indicators that have been developed for project team members relating to infrastructure sustainability. The matrix should help ensure a multi-disciplinary sustainability advisory team and give clarity to other project team members on their responsibilities.

- Reference to requirements of any related sustainability performance rating tools (where rating is being sought).

- Preliminary approach to measuring, monitoring and reporting (Stage One Step 3) including how infrastructure sustainability and sustainability outcomes will be communicated to internal and external stakeholders. This may be expressed in the form of a communications plan.

- Link to other key features of approach to governing infrastructure sustainability including the sustainability policy (with the whole policy provided in an appendix), and the SIR.

The plan or strategy therefore provides an important documented ‘base’ for the approach to governing infrastructure sustainability.\textsuperscript{1010} Its contents and form may also be guided by relevant standards, namely British Standard (BS) 8901, where certification is being sought.\textsuperscript{1011} The plan or strategy would need to be updated as the project progresses (Figure 10). Finally, the plan or strategy should be communicated to external stakeholders for example on the project website.\textsuperscript{1012}

\textsuperscript{1009}The development of the roles and responsibilities matrix and the sustainability resource plan may form a new step in the framework depending on how the plan or strategy is to be communicated. If it is an internal document, then it would be appropriate for that information to be included. If the plan or strategy is going to be made available to the public, the matrix and resource plan and any other sensitive information may need to be excluded.

\textsuperscript{1010}See Part V Section B(2).

\textsuperscript{1011}See Part V Section B(2).

\textsuperscript{1012}As per ODA and ODAT’s approach, see Part IV Section B(11).
The key activities and deliverables of Stage Two Step 2 are therefore:

- Policy positions on each theme.
- Sustainability policy that is communicated to every project team member.
- Sustainability plan or strategy.

The expected outcomes and benefits are:

- A formal, documented approach to infrastructure sustainability.
- Linkages and interface between plan or strategy and other work stream plans and activities are clearly understood and addressed, with responsibility appropriately assigned.
- Leadership-level employees are aware of the infrastructure sustainability agenda and governance approach, and are committed.

3 Stage Three – Integration with Project Delivery Processes

The below steps in Stage Three will take place concurrently with the other stages and steps, excluding Stage Five that relates to handing over the approach to the operator or asset manager (see Figure 10).
(a) Step 1 – Design Processes Interface

There will already be some interaction between the design team and the sustainability advisers in exploring and developing sustainability objectives, targets and initiatives as per Stage One Step 3 above. This will take place at the early stages of design and project delivery. However this interaction needs to continue throughout project delivery. As more information about the shape and form of the project is available, the SIR in particular will need to be updated to ensure the specific initiatives to reach sustainability objectives and targets are ‘do-able’ in the context of project-specifics.

An on-going commitment to building the capacity of the design project team members, and specifically key design decision-makers, is critical in this step. Such capacity building would include helping designers to understand the true sustainability of initiatives including through the application of decision-support tools such as life-cycle assessment (LCA).1013 This should be achieved through on-going consultation and engagement between the advisers and the design team, including through participation in weekly design meetings1014 either specifically on infrastructure sustainability or with an infrastructure sustainability agenda item. This should also be achieved by election of design ‘champions’ that are ideally part of the sustainability advisory team, but who also work directly with the design team on other design tasks. As with the other work streams, there should be design employee key performance indicators for achieving the sustainability commitments articulated in the plan or strategy.

Interfaces between design processes and the governance approach should already have been articulated in the plan or strategy, as discussed above.

The key activities and deliverables of Stage Three Step 1 are therefore:

- Sustainability advisers continue to develop and update the SIR in consultation with other project team members.
- Sustainability objectives, targets and initiatives are embedded in design outputs.
- Design ‘champions’ are elected.

The expected outcomes and benefits are:

1013 See Part III Section B(8) and Part V Section B(8).
1014 See Part III Section B(4).
- Enhanced capacity of design team.
- Design team ownership of infrastructure sustainability and sustainability outcomes.
- Advisers realise opportunities in design processes.
- Design team ‘on-board’.
- Initiatives embedded in design outputs.

(b) Step 2 – Planning Approval Processes Interface

In Stage Three Step 2, the sustainability advisers should work with the planning team to see how the sustainability objectives, targets and initiatives, and even the plan or strategy, can be connected with planning approval processes. This connection would relate to how sustainability objectives, targets and initiatives are reflected in conditions of consent, so that such conditions can be used as a ‘stick’ or forceful driver for gaining momentum on infrastructure sustainability, giving impetus to the overall approach to governing infrastructure sustainability.1015

Another important consideration is how impacts identified in an impact assessment, such as an environmental impact assessment or social impact assessment, can inform the development of sustainability objectives, targets and initiatives.1016 Hence, this interface will depend on when this framework, and more specifically the various stages and steps, is applied in the project delivery phase. If applied at planning and feasibility, preliminary sustainability objectives and targets will be developed prior to the planning approval stage, as will the sustainability policy and plan or strategy. However, the plan or strategy can be updated to reflect or address any issues found in the impact assessment, as can the SIR. And at the same time, these framework components can help inform the impact assessment. In any case, connections and interfaces between planning approval processes and the approach to governing infrastructure sustainability should be understood, maximised, and made explicit.

The key activities and deliverables of Stage Three Step 2 are therefore:
- Sustainability objectives, targets and initiatives are connected with conditions of consent.

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1015 See Part V Section B(5) and Part IV Section B(5).
1016 See Part V Section B(5).
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- Outputs of impact assessment used to inform sustainability objectives, targets and initiatives.
- Research on sustainability objectives, targets and initiatives used to inform impact assessment activities.
- Update framework components including plan or strategy based on impact assessment outputs.

The expected outcomes and benefits are:

- Enhanced capacity of planning team.
- Planning team ownership of infrastructure sustainability and sustainability outcomes.
- Providing a ‘stick’ to motivate on infrastructure sustainability.
- Planning team ‘on-board’.
- Advisers realise opportunities in planning approval processes.
- Sustainability objectives, targets and initiatives embedded in planning approval and impact assessment documentation.

(c) Step 3 – Procurement Processes Interface

Integrating the approach to governing infrastructure sustainability with procurement processes, and further, using procurement (including tender evaluation) processes to help achieve sustainability commitments, is a critical step. The procurement policy, and plan or strategy, should reference the sustainability policy and plan or strategy, and where relevant, specific sustainability objectives and targets. A specific sustainable procurement policy may also be of value. Relevant guidelines do exist which will be useful in the articulation of a sustainable procurement policy, and plan or strategy. b Whether infrastructure sustainability and desired sustainability outcomes are articulated in the main policy and/or a specific sustainable procurement policy, this interface needs to be highlighted to the procurement team, other relevant project team members, and external stakeholders as appropriate. Further, a crucial activity in this step is for sustainability advisers to be working with the procurement

team and other relevant project team members in articulating the sustainability requirements, and to obtain general ‘buy-in’.\textsuperscript{1018}

The sustainability advisers should again consider the delivery method and contract types as they pertain to the procurement of contractors. Some delivery methods and contract types, such as public private partnerships (PPP) or alliances, may be more conducive to infrastructure sustainability and sustainability outcomes than other types such as design and construct contracts.\textsuperscript{1019} However, regardless of the delivery method and contract type, the advisers should take care to clearly communicate and articulate the proponent’s sustainability commitments.\textsuperscript{1020} The advisers will then have to use discretion as to how prescriptive to make the sustainability requirements, although it is recommended that they are non-prescriptive to the greatest extent possible.\textsuperscript{1021} Innovation should be encouraged, and contractors who will actually be designing and/or constructing the project will need to discern what targets and initiatives are possible.

However, contractors need to be held accountable for achieving good sustainability outcomes and performance. The proponent should provide the initial SIR to the tenderers and ask the tenderers to respond with their own targets and initiatives where they believe they can improve on or need to alter them, for example based on constructability issues.\textsuperscript{1022} The main objective should be to test and trust the market to an appropriate extent, while specifying that certain targets and initiatives are achieved (or improved upon) that are viewed as critical to reaching the desired sustainability outcomes.\textsuperscript{1023} Deviation from achieving good or desired sustainability performance needs to be backed by sound reasoning and explanation to the proponent and other stakeholders.

Some minimum sustainability requirements to ask of any contractor as part of this framework include i) to progress the proponents sustainability plan or strategy, including by developing, where applicable depending on the delivery method, a complementary plan or strategy for example for construction and/or operations, ii) to demonstrate the organisational structure for

\begin{flushleft}
\textsuperscript{1018} See Part V Section B(6).
\textsuperscript{1019} Ibid.
\textsuperscript{1020} See Part V Section B(6).
\textsuperscript{1021} Ibid.
\textsuperscript{1022} Ibid.
\textsuperscript{1023} Ibid. Methodologies may also need to be specified to simplify the proposal evaluation process.
\end{flushleft}
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sustainability; and roles and responsibilities, including the sustainability manager/s’ experience, qualifications, qualities and attributes as relevant to the proponent’s sustainability commitments, and iii) request interviews as discussed below to gauge the existence of desirable attributes within the contractor’s team. This also applies to engagement of any new sustainability advisers to the proponent organisation, and should be articulated in the sustainability resource plan.

Once the sustainability requirements have been articulated, they need to be embedded and integrated throughout all relevant procurement documentation including those relating to design and environmental management plans. This would be assisted by the table within the plan or strategy highlighting the linkages between the sustainability commitments and the different work stream plans and activities as highlighted in Table 5 above, as well as the map developed in Stage One Step 1 on what is going on, and out, and who is responsible for what.

In terms of requiring contractors to achieve a certain sustainability performance tool rating, it will be important to examine the compatibility of the tool requirements with the sustainability imperatives as set out in the sustainability policy and plan or strategy. The tool requirements would already have been examined in Stage One above, and as such the advisers should already understand what is required and how suitable the tool is when developing the sustainability requirements. Also, it will be imperative to consider the financial implications of requesting a contractor to achieve a certain rating. This should be considered in the ongoing development of the sustainability resource plan as discussed in Stage One Step 1. Critically however, a sustainability performance rating tool should both be viewed by advisers and explained to the project team as being one tool in the ‘toolbox’ of the approach to governing infrastructure sustainability.

Embedding infrastructure sustainability into proposal and tenderer evaluation is also a critical component of this step. This can be achieved by basing a percentage of the tender evaluation on sustainability, as well as requiring that the contractor has a sustainability management system or sustainability policy of its own. However, the advisers should consider that having a policy in itself will not guarantee good infrastructure sustainability performance. Further, it

1024 Ibid.
1025 See Part V Section B(6).
is important to provide the tenderers with a level playing field by, for example, prescribing that a certain methodology be used in calculating GHG emissions or undertaking a climate change risk assessment.\textsuperscript{1026} This will be dependent on whether there is a suitable and reputable methodology to be prescribed in the first place.

The advisers may also wish to consider again prioritising the most important sustainability objectives and targets, and requesting the tenderers to concentrate on those, rather than every material objective and target provided in the plan or strategy, and/or SIR.\textsuperscript{1027} The advisers will need to use discretion as to whether such a prioritisation process might yield more suitable results for facilitating a proposal evaluation.

Finally, interviews between the proponent organisation and the contractor’s team should be undertaken. The interviewers should include representatives from the sustainability advisory team. The aim of the interviews is to ensure the contractor’s team – and more specifically any sustainability advisers being engaged as part of the contractor’s team – share the same sustainability values as the proponent, and have the right qualities and attributes.\textsuperscript{1028}

Steps 1 to 3 of Stage Three may happen concurrently depending on the delivery method and specific project program. Advisers should in general be wary of viewing project delivery as a linear process because, as discussed in Part V Section B(6), many stages and their processes can happen concurrently, and this needs to be taken in consideration in the implementation of this framework. There may be other important interfaces between the approach to governing infrastructure sustainability and the project team work streams including the communications team, which are not discussed here. The sustainability advisers applying this framework should consider these interfaces on a project-by-project basis, but be informed by the ‘linkages’ table created within the plan or strategy in Stage Two Step 2.

The key activities and deliverables of Stage Three Step 3 are therefore:

- Procurement policy to articulate infrastructure sustainability and sustainability outcomes.
- Understand opportunities and constraints of delivery method and contract type.

\textsuperscript{1026} Ibid.
\textsuperscript{1027} Ibid.
\textsuperscript{1028} Ibid.
- Seek balance between prescription, and testing and trusting the market, in the sustainability requirements.
- Embed sustainability requirements throughout all relevant procurement documentation.
- Require the achievement of a specific sustainability performance rating tool score or rating where appropriate.
- Require the development of a (contractor) sustainability plan.
- Embed infrastructure sustainability into proposal and tenderer evaluation.

The expected outcomes and benefits are:
- Enhanced capacity of procurement team.
- Procurement team ownership of infrastructure sustainability and sustainability outcomes.
- Advisers realise opportunities in procurement processes.
- Procurement team ‘on-board’.
- Sustainability objectives, targets and initiatives embedded in procurement documentation.

4 Stage Four – On-Going Implementation Requirements

(a) Step 1 – Measuring, Monitoring and Reporting

A process for measuring, monitoring and reporting should already have been considered in the implementation of the preceding steps, and specifically in the sustainability plan or strategy (see Stage Two Step 2). Also, the SIR should have been developed with preliminary indicators through which to measure progress toward targets, as well as to track the development of initiatives (see Stage One Step 3).

However, it is these later stages of project delivery to which Stage Four applies, namely detailed design and construction, (Figure 10), where progress toward targets can be evaluated because this is where things start to happen ‘on the ground’. It is also where tracking needs to take place to ensure that sustainability targets and initiatives specified through procurement processes and in the early design stages are indeed being delivered, and are not being ‘designed out’.

Key activities to be adopted in the approach to, or protocol for, measuring, monitoring and reporting are:
Development of indicators that conform where appropriate to GRI, conditions of consent, and sustainability performance rating tool requirements.

On-going refinement and checking of design outputs including construction specifications against the SIR.

On-going progress reports both internally, for example to the leadership-level, and externally, for example in the form of annual sustainability reporting in line with GRI reporting requirements.

Ensuring advisers are adept at data collection and analysis to inform reporting, as well as ensuring other parties are informed about their role in data collection and analysis.

Development of action plans to address any issues or instances of non-conformance that are made the responsibility of specific project team members.

Continually updating targets and initiatives based on outcomes of the approach to measuring, monitoring and reporting, which will necessarily reflect changes including in stakeholder expectations, available technology, project-specifics and local conditions.

Updating other aspects of the overall approach including the roles and responsibilities matrix and the sustainability resource plan.

It may also be appropriate to undertake internal audits and external verification of the overall approach to governing infrastructure sustainability including the plan or strategy, and the measuring, monitoring and reporting protocol, the key features of which are outlined above.

The key activities and deliverables of Stage Four Step 1 are therefore:

- Tracking both progress toward targets and the implementation of initiatives.
- Reporting internally and to external stakeholders.
- Developing action plans to address any issues.
- Updating targets and initiatives, and other aspects as appropriate.
- Undertaking internal audits and external verification where appropriate.

The expected outcomes and benefits are:

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1030 See Part V Section B(9).
• Approach is continually updated to help ensure its relevance and effectiveness.
• The project itself can be monitored for progress toward sustainability outcomes and commitments. This will be ongoing into the operational phase as per Stage Five (below).
• Continuous improvement in infrastructure sustainability.
• Creating and maintaining the trust and support of communities and other stakeholders.
• Marketing and public relations benefits.

(b) Step 2 – Sustainability Performance Rating Tool Assessment

Step 2 Stage Four pertains to seeking, where it is available and desirable, a rating from a sustainability performance rating tool. However, depending on the tool, rating may already have been sought at an early stage of project delivery. For example, CEEQUAL, an assessment and awards scheme for improving sustainability in infrastructure projects, provides an interim award which can be sought at the ‘outline’ design stage. However, both CEEQUAL (and seemingly the Australian Green Infrastructure Council (AGIC)) typically rate projects at later stages for example during or following detailed design and construction.1031 This is more appropriate because not enough information would necessarily be known about the project to obtain a rating at very early stages of project delivery such as conceptual design, particularly when most questions in CEEQUAL pertain to design and construction stages.

In any case, the advisers’ role in reviewing the tool requirements during Stage Two Step 1, and aligning those requirements with the sustainability plan or strategy, and procurement sustainability requirements, should provide adequate preparedness for obtaining a good rating. The assumption here is that key decision-makers in the project team (which at this stage could also comprise the contractor for example the consortia in a PPP) see value in obtaining a rating, an opinion which will be influenced by the sustainability advisers, who would have recommended it where appropriate as part of sustainability resource plan developed and progressed by the proponent organisation during Stage One and Stage Two (Figure 10). The sustainability resource plan would also have identified the individuals

1031 See Part IV Section B(6).
responsible for undertaking the rating tool assessment and ensuring compliance with its requirements.

The advantages of using a sustainability performance rating tool should be articulated by the advisers and include marketing and public relations value, as well as helping to inform the project team of what is possible. Further, assessment results can help inform the tracking process outlined in Step 1 above because new data can come to light. Finally, if the advisers or other project team members become trained assessors for a particular sustainability-rating tool, this can enhance the skills and capacity of those individuals which they can take to other projects in legacy.

The key activities and deliverables of Stage Four Step 2 are therefore:

- Seek rating from applicable sustainability performance rating tool.
- Use provisions in sustainability performance rating tool to add value to overall approach as appropriate (see also Stage Two Step 1 above).

The expected outcomes and benefits are:

- Marketing and public relations value.
- Project team is better informed of what sustainability outcomes are possible.
- Feeling of pride within project team if high rating is achieved.
- Skills attained and lessons learnt can be transferred to other projects in legacy.
- Value add to overall approach.

(c) Step 3 – Project Team and Contractor Workshops and Meetings

Further workshops and meetings with the proponent project team and contracting teams should be undertaken by the sustainability advisers (which at this stage may include those employed with the contractor organisation) as part of Stage Three Step 3. The aims of these workshops and meetings are to i) discuss any issues that may be arising in implementing infrastructure sustainability including specific initiatives, ii) assist the advisers in implementing the process of tracking as outlined in Step 1 above, including updating targets.

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1032 See Part IV Section B(9).
and initiatives, and iii) assist in ongoing building and nurturing of employee appetite for, and understanding of, infrastructure sustainability.

These workshops and meetings may take various forms, including as part of on-site health and safety meetings, in design review meetings, or as separate sustainability workshops that take place on a weekly or monthly basis. The most appropriate avenues through which to discuss infrastructure sustainability issues will need to be discerned on a project-by-project basis by the sustainability advisers, and based on the plan or strategy.

As with the initial workshop in Stage One Step 4, knowledge sharing and capacity building would be key activities in these workshops and meetings, as well as discussing lessons learnt from implementing infrastructure sustainability on the project in question. These lessons learnt should be recorded for sharing across projects, industry and with other external stakeholders.\(^{1033}\)

The key activities and deliverables of Stage Four Step 3 are therefore:

- Include infrastructure sustainability agenda items in existing project meetings.
- Host separate sustainability workshops or meetings where necessary or favourable.
- Ensure knowledge sharing amongst team members takes place.
- Record lessons learnt in implementing infrastructure sustainability.

The expected outcomes and benefits are:

- Ongoing capacity building.
- Ongoing awareness raising of expectations; as well as any changes in targets, initiatives or overall approach.
- Ongoing nurturing of employee appetite for infrastructure sustainability.
- Creating an environment for discussion and problem solving.
- Lessons learnt to improve performance on remainder of project and subsequent projects.

\(^{1033}\) See Part V Section B(10).
(d) Step 4 – Communicating and Knowledge Sharing with External Stakeholders

In Stage Four Step 4, the sustainability advisers or other relevant professionals should ensure they are participating in external knowledge sharing forums such as conferences, community events\textsuperscript{1034} and working groups. The lessons learnt derived from Step 3 above would help in this knowledge sharing activity, as will the information recorded as part of the process for measuring, monitoring and reporting.

Ideally, the CEO or other leadership-level employees should also be sharing experiences and promoting infrastructure sustainability and sustainability outcomes within relevant forums. Sustainability advisers should therefore consider this as part of their capacity building efforts to bring the leadership-level ‘on board’. Such capacity building efforts may take place formally, for example as part of workshops and meetings as per Stage One Step 4 and Stage Four Step 3 above, or more informally as part of efforts to build solid relationships,\textsuperscript{1035} and present sustainability-related research in an accessible manner.\textsuperscript{1036}

Communicating on progress toward sustainability objectives and targets should be facilitated through collaboration between the sustainability advisers and the communications team.\textsuperscript{1037} This linkage should again be articulated in the plan or strategy, and linked to the roles and responsibilities of the communications discipline employees, for example through the matrix discussed in Stage One Step 2 and any subsequent key performance indicators. There will also be inherent links between this step of communicating to external stakeholders and the process for measuring, monitoring and reporting.

The key activities and deliverables of Stage Four Step 4 are therefore:

- Advisers and other relevant professionals to share knowledge in external forums.
- Encouraging the leadership-level to communicate externally on project infrastructure sustainability performance.
- Engaging communications team to communicate to external stakeholders on progress toward sustainability objectives and targets.

\textsuperscript{1034} Participation in community events, or even visiting schools in the vicinity of the project and sharing information on certain initiatives, would be valuable.
\textsuperscript{1035} See Stage One Step 2 above.
\textsuperscript{1036} See Part V Section B(7).
\textsuperscript{1037} See Part IV Section B(10).
The expected outcomes and benefits are:

- Marketing and public relations value.
- Creating and maintaining the trust and support of communities and other stakeholders, especially future customers or end users of the facility.
- Enhanced capacity of communications team to understand infrastructure sustainability.

5 Stage Five – Hand Over to Operator or Asset Manager

As highlighted in Figure 1 in Part I, for the purposes of this thesis the delivery phase ends at commissioning. Therefore, the framework presented in this part ‘ends’ at this stage of the project life. However, it will be absolutely critical that a number of components of the framework are effectively handed over at commissioning and into operations. This would include but not be limited to the sustainability plan or strategy, and the measuring, monitoring and reporting protocol. Clearly, for sustainability outcomes to actually materialise, there needs to be ongoing commitment and activity to ensure targets are being met, and initiatives maintained, over the long-term.

Some initiatives will be embedded during design and construction, and require limited further consideration – for example designing the height of a station for a certain level of flood risk that has taken into account the latest climate change predictions. However, other initiatives will require ongoing maintenance and checking, for example the use of solar panels on noise walls, or the restoration of biodiversity as part of a commitment to achieve a net gain in biodiversity outcomes. Also, where flexibility has been built into the design to allow for the adoption of future technologies, such future technologies would need to be continually investigated and adopted where applicable. This could include, for example, energy efficient lighting or advances in audible information technology.

Where the operator is also involved in delivery, as per a PPP contract type, there will be a greater chance of continuity between the framework and its key components, and ongoing operations. Ideally, the sustainability advisers would continue to work as part of the team responsible for the operational phase of the project. However, where this is not the case, a plan for handing over the approach to governing infrastructure sustainability developed as a result of implementing this framework to the operations team is crucial. As part of the plan
for handing over, the sustainability plan or strategy should be updated to reflect operational sustainability requirements.

The key activities and deliverables of Stage Five Step 1 are therefore:

- Develop a plan for handing over the approach to governing infrastructure sustainability to the operations team.
- Update plan or strategy and other relevant components, including measuring, monitoring and reporting process to account for changes such as in technology, regulation and stakeholder expectations.

The expected outcomes and benefits are:

- Realisation of sustainability outcomes into the long-term.
- Building capacity and skills of operations team on sustainability.

C Conclusion

This part has presented a framework for governing infrastructure sustainability in five stages comprising a number of steps. These stages and steps, and the linkages between them and with different project delivery stages, are represented diagrammatically in Figure 10. Some of these steps happen concurrently and provide important feedback loops, particularly in the ongoing development of the SIR, and the sustainability plan or strategy. These stages and steps have been developed based on the two case studies found in Parts III and IV, and from the key findings of Part V which undertook a comparative study of the two case studies. The next and final part concludes this thesis, reflecting on the research outcomes as well as contributions resulting from this thesis. It also provides recommendations for further research.
VII CONCLUSION AND RECOMMENDATIONS

A Overview

This part summarises the key findings and theory developed throughout this thesis. It begins by restating the research topic, and research questions and objectives. An overview is provided of how each research question has been responded to. Following this, the author outlines some opportunities for further research. These recommendations serve to identify issues and topics that have great potential to produce interesting, contemporary and useful research outputs in both an academic research context, and for the infrastructure industry including relevant professionals such as sustainability advisers. Finally, the applicability of the framework is revisited including recommendations for enhancing it through further research and trialling on other infrastructure projects.

1 Summary of Research Topic

This thesis has explored two case study approaches to governing infrastructure sustainability. Infrastructure sustainability was broadly defined as processes, activities and practices that seek to minimise negative impacts and maximise opportunities across economic, social and environmental dimensions over the life of a facility, during the project delivery phase. Four infrastructure sustainability principles of beyond compliance, continuous improvement, whole-of-life thinking and innovation were identified to clarify the concept.

Governing infrastructure sustainability was defined in Part I Section A as the establishment and oversight of a structure to purposefully manage infrastructure sustainability and sustainability outcomes during the project delivery phase. A review of the literature revealed that this research topic is underexplored, with a focus being on the development of infrastructure sustainability assessment and rating tools. Such tools typically assist in the selection of different project options based on sustainability considerations, and provide a rating of the ‘sustainability’ of an infrastructure project at various stages of project delivery, respectively.
Qualitative case study research methods were selected to explore the research topic. More specifically, two organisations responsible for delivering urban rail infrastructure projects were selected as case studies. This selection process was assisted through a first round of interviews with various individuals working in the urban rail sector in New South Wales (NSW) – individuals who were also able to give guidance on potential case studies at an international scale. The Sydney Metro Authority (SMA) and the Olympic Delivery Authority (transport division) (ODAT) were selected as case studies, and their respective approaches to governing infrastructure sustainability have been explored.

For each case study, a number of research questions were investigated, namely on i) the internal and external drivers of addressing infrastructure sustainability, ii) the key components of the approach to governing infrastructure sustainability, and iii) the key challenges to addressing and governing infrastructure sustainability, and how these challenges were overcome.

### B Internal and External Drivers

In both case studies, internal and external drivers were similar. The Olympic Delivery Authority (corporate) (ODA), and more specially ODAT, has had various internal and external drivers for addressing and developing an approach to governing infrastructure sustainability. The pure scale of the Games and its associated projects makes ODA and ODAT answerable to the community and various other stakeholders. This is particularly the case given negative publicity associated with some Olympic Games and other mega sporting event endeavours. Avoiding such negative publicity has been an important driver for ODA’s legacy planning, which by its very nature includes the pursuit of sustainability outcomes.

Despite the fact that the Sydney Metro project was not Olympic-related, it was still a large project receiving significant amounts of media attention. Overall, both organisations have been associated with mega projects with significant amounts of funding, that are in the ‘public eye’. This may have resulted in more resources being available for undertaking infrastructure sustainability and developing effective governance mechanisms. Hence, it is
possible that neither case study represents an ‘average’ project either in the urban rail sector or infrastructure industry more broadly. However, and as discussed in Part VI Section A, that both case study organisations arrived at similar approaches independently is compelling evidence that the framework for governing infrastructure sustainability, which has been developed based on these approaches, is suitable for at least trialling on other projects.

Applicable legislation and policy relating to infrastructure sustainability have also been drivers, and has included for SMA the NSW Government Sustainability Policy. ODA and ODAT are part of a larger team – the London 2012 Team – and are closely linked with other stakeholders such as the Greater London Authority. Such stakeholders typically have an existing sustainability agenda which has fed into how ODA and ODAT conduct their activities.

The existence of such drivers confirms that they are a critical ingredient in the development of an approach to governing infrastructure sustainability. This is largely because key decision-makers on a project initially need to deem an approach to governing infrastructure sustainability to be of value and/or necessity in order for resources to be invested in developing an approach. This has implications for the application of the framework as discussed in Part VI Section A.

C  The Case Study Approaches, and Challenges and Overcoming Them

This section summarises the research findings relating to the key components of each case study approach to governing infrastructure sustainability, and how the various challenges faced by the respective organisations were overcome. It also highlights further research that is needed to address some gaps, although recommendations for further work are provided in more detail in Section D of this part.

(a) Overall Approaches

Both case study organisations adopted similar approaches to governing infrastructure sustainability, albeit they did so independently of each other. Both SMA and ODAT had or
have an overarching management framework – SMA its Sustainability Management Framework and ODAT its Sustainability Management System (SuMS). The SuMS is based on BS 8901 which, although being targeted at events, covers the delivery and operation of events-related infrastructure. While BS 8901 provides a suitable structure for the key features of a governance approach, and incorporates sound management system principles including continuous improvement, the framework presented in Part VI goes a few steps further.

For a start, the framework provides more specific guidance than BS 8901 for developing and implementing an approach to governing infrastructure sustainability which is suited to the specific context of an urban rail infrastructure (and potentially other infrastructure) project. It has mechanisms for addressing key challenges that will likely arise, for example ongoing workshops and meetings to build the capacity and appetite of project team members in infrastructure sustainability. The framework also facilitates the integration of the sustainability policy, plan or strategy; and sustainability objectives, targets and initiatives; with all relevant work stream activities – something that is not explicitly covered by BS 8901.

In both case studies, embedding and integrating an approach to governing infrastructure sustainability was found to be of critical importance. ODAT’s SuMS clearly articulated these interfaces, and itself was part of an integrated Sustainability, Safety, Health, Environment and Quality Management System (SSHEQ). In SMA’s case, this happened more organically, in that the sustainability advisers were advanced enough in their thinking and understanding of infrastructure sustainability to actively work with other work streams to ensure the approach or Framework was embedded and integrated. This is why – amongst other things – engaging sustainability advisers with the right skills set and experience is crucial for achieving sustainability outcomes.

Both SMA and ODAT adopted sustainability objectives (largely qualitative) and targets (largely quantitative), and devised specific initiatives to meet those sustainability objectives and targets throughout project delivery. The sustainability objectives and targets were separated or categorised under various ‘themes’ – themes that are largely consistent with the seven themes listed in Part I Section A(2). The author applied these seven themes in the framework presented in Part VI, namely: project management and governance, resource use, emissions, biodiversity, infrastructure resilience, socio-economic, and people and place.
Part VII Section C

The need to – and advantages of – prioritising themes, objectives, targets and/or initiatives was discussed based on the case study approaches. ODAT in particular reduced the high-level sustainability commitments found in London 2012 Sustainability Policy and Plan to three themes. This allowed for efforts and resources to be targeted, and allowed for constraints associated with the urban rail sector, including standardisation, to be accounted for. Prioritisation is built into the framework found in Part VI, and methodologies for doing so are starting to appear in the literature.\(^{1038}\) However, further research in this area, including on the role of multi-criteria decision analysis, would be appropriate.

(b) Interfaces – Planning Approval, Design and Procurement Processes

There is a critical interface between design processes and the approach to governing infrastructure sustainability. One aspect of this interface is embedding sustainability policy commitments and – where possible – actual targets into early design stages including by embedding those commitments into design briefs. The feasibility of design initiatives then have to be demonstrated, particularly to key decision makers at the leadership-level, as was the case for SMA. Having a Sustainability Initiatives Register (SIR) to track initiatives particularly at the design stage but then into planning approvals, procurement and construction is necessary and fruitful. Such a tracking process is particularly important for ensuring that certain initiatives are not ‘designed’ or ‘scoped out’. The SIR can be provided to tenderers that can then test and where possible exceed those targets. As will be discussed below, specific targets and initiatives may become redundant if the design changes to a significant extent in later detailed design stage activities. Consequently, the proponent needs to ensure it understands what targets it is not willing to compromise, and then write the achievement of those targets into contractual arrangements. Ensuring a process for accountability for key design-related decision makers to address sustainability targets was also revealed to be important.

This research demonstrated that it is important to integrate known sustainability objectives, targets and initiatives into the planning approval process. They then become a matter of compliance – providing a ‘stick’ to encourage implementation. This is dependent on the rigour and enforcement provisions in the planning approval process in question. Other

\(^{1038}\) See Part V Section B(3).
opportunities in how the development of sustainability objectives, targets and initiatives can inform and in turn be informed by impact assessment activities should also be considered.

It is acknowledged that in the case of ODAT, data gathered on the interface between the approach to governing infrastructure sustainability and the planning approval process was minimal. In reflecting on how the research could have been improved, further data gathering and analysis of planning approval processes (relating specifically to the transport context) would have been beneficial. This would have addressed the issue of using ODA data to explore this issue as a substitute for ODAT-specific data.

The connection between procurement processes and the approach to governing infrastructure sustainability was also revealed to be critical. The delivery method and contract type will affect the ability and appetite of the project team to address infrastructure sustainability – where relationship-based contracts appear the most conducive to infrastructure sustainability and sustainability outcomes. However, this needs to be further explored in the context of further research, as recommended below. For example, even a design and construct contract might result in outstanding infrastructure sustainability and sustainability outcomes, provided the proponent’s sustainability requirements are effective in promoting such practice and outcomes, and further, that there is an effective assurance process as part of measuring, monitoring and reporting. Proponents therefore need to be ‘smart’ and know what to ask of contractors in procurement processes.

There is a delicate balance to be found between allowing the market to provide innovative ideas as part of the procurement process – or being non-prescriptive – and requiring certain methodologies to be applied or processes to be adopted. SMA dealt with this through its approach of providing the SIR, and requesting the bidding consortia to provide information on how they would meet or exceed targets embedded in the SIR (and justify why some targets could not be met), was successful in that the responses were generally deemed to be of high standard. However, a criticism of the SIR approach was identified to be that significant amounts of resources were invested in the pre-procurement design stages where not a lot of information was known about the project. Some of this investment may have been redundant. It is therefore recommended that the proponent make clear its sustainability objectives to the market – objectives which would be developed as part of the sustainability policy, and plan or
strategy. The proponent should then ask the tenderers to provide the detail (including actual targets) on how those sustainability objectives would be achieved. Further, it may be appropriate for the proponent to actively prioritise sustainability objectives, and request the tenderers to concentrate on those considered most important or ‘material’. This is incorporated into Stage 3 Step 3 of the framework.

In addition to the approach adopted by SMA, the proponent needs to ensure that resources are invested in researching how to meet the targets it is not willing to compromise, or the methodologies it deems to be most appropriate. Both SMA and ODAT communicated targets that needed to be met in the procurement documentation – for example SMA its target of offsetting 100 per cent of operational GHG emissions, and ODAT its 90 per cent target for recycling and re-use of materials. Including within the procurement documentation the ‘boundaries’ for developing processes and initiatives to achieve sustainability objectives and/or targets – including through prescribing a certain methodology – will be useful. It will ensure that the tenderers’ outputs and approaches to addressing the proponent’s sustainability requirements will be presented in a similar manner. This will help facilitate a fair evaluation in the tender evaluation process. The proponent again needs to find a balance between being non-prescriptive and providing adequate guidance or ‘sign posts’ to the tenderer.

In any case, it is imperative for the sustainability objectives, and any specific targets and methodologies, to be communicated and embedded across all relevant components of the procurement documentation. This is crucial because of the diversity inherent in the infrastructure sustainability concept – whereby each theme relates to various disciplines including design, environmental management, communications, construction management and so forth.

As stated, developing sustainability targets to be specified in procurement processes needs to be undertaken using robust research and market testing, including through engagement along the supply chain. This will be important for testing the viability of certain targets, and the ability for contractors and/or suppliers to meet those targets. This engagement will help ensure that expectations of the market are reasonable, and there are appropriate levels of understanding. The proponent will also be able to learn a lot about what is possible from this engagement process – building its own knowledge and capacity in sustainability. ODA’s
CompeteFor website is of particular relevance in this context, and a similar website at local scales should be considered in other jurisdictions – whether it be for a mega sporting event, or for a large infrastructure project such as a new metro system.

There is a clear and important role for sustainability advisers in developing sustainability requirements as part of procurement processes. On one hand, the advisers need to consider the amount of resources that need to be spent on developing business cases and using other decision-support tools if the targets and initiatives may later change to an extent the original work becomes obsolete. This is covered in the framework for governing infrastructure sustainability, particularly in the steps relating to the sustainability resource plan. On the other hand, the sustainability advisers need to build the capacity of the procurement team, in particular to ensure the sustainability requirements are articulated properly in the procurement documentation. In the SMA case in particular, a lack of appetite for infrastructure sustainability and conservatism within the procurement team was a key challenge that needed to be overcome by sustainability advisers through tenacity and other such attributes. Other desirable qualities and attributes of sustainability advisers, along with roles and responsibilities, are discussed further below.

It was found that that companies working within different sectors of the infrastructure industry have different levels of capacity to respond to sustainability requirements and deliver sustainability outcomes. In the ODAT case study, it was indicated that companies working in the urban rail sector have had less capacity than companies from other sectors in the infrastructure and property industries, such as those working in buildings.\(^\text{1039}\) This means that where the framework found in Part IV is being used for an infrastructure project from a different sector, different levels of resources will be needed to build the capacity of and inform the relevant suppliers, contractors or subcontractors.

Requiring the achievement of a certain score or rating in CEEQUAL, an assessment and awards scheme for improving sustainability in infrastructure projects, was an important part of ODAT’s sustainability requirements. Such an approach will probably also be considered in Australia by various proponents and their delivery partners once the Australian Green Infrastructure Council (AGIC)’s rating tool is operational. Proponents and delivery partners

\(^{1039}\) See Part IV Section B(7).
need to appreciate, however, that the use of such rating tools should be only one tool in the ‘tool box’. Specifying the use of a tool might not actually tell the proponent what sustainability targets or initiatives the contractor will implement – it will only help ensure that the score being requested is achieved. Specifying a tool places the onus on the provisions of the tool to achieve good or desired outcomes. Therefore, relying heavily on a tool will only be beneficial if the tool itself is capable of achieving those outcomes. The ability of CEEQUAL and AGIC’s rating tool to achieve desirable sustainability outcomes should be the topic of further research, as recommended below.

Interviewee OS2 made a critical observation when he highlighted the importance of having a strong auditing and assurance process to ensure sustainability commitments actually materialise. ODA’s approach to measuring, monitoring and reporting included a seemingly robust assurance process, as discussed above, and indeed SMA acknowledged the need for such a process. However, this raises a limitation with this research in that the author was unable, in the given timeframe, to assess whether the sustainability targets and initiatives as written into contractual arrangements have actually been followed through or implemented. This is critical for judging the real, long-term effectiveness of the approaches to governing infrastructure sustainability (and clearly because the Sydney Metro project was deferred, such post-review would not have been possible for that project).

This does not mean that the approaches are ineffective. On the contrary, it is fair to assume that the recognition and focus in both cases – but in particular ODAT – on providing a robust assurance process would very likely have led to ongoing infrastructure sustainability and sustainability outcomes. The author plans to pursue further research into actual infrastructure sustainability and sustainability outcomes taking place at later project delivery stages, commissioning and operations – at least until the end of the London 2012 Games. This activity would be compared to ODAT’s original infrastructure sustainability commitments and sustainability requirements of contractors as discussed throughout this thesis.

Such further research will be of value because a process-oriented approach (such is described in this thesis for both case studies and in the framework) is only valid if desirable and indeed planned outcomes (as per sustainability objectives and targets) are achieved in practice. This is also why undertaking case studies into the outcomes achieved as a result of using
CEEQUAL or AGIC’s rating tool is important to judge their effectiveness. These case studies should be undertaken post-rating, ideally during the operation of the facility, and should be compared against a ‘base case’ or benchmark project where the tool has not be applied.

(c) Roles and Responsibilities

The roles and responsibilities of sustainability advisers were discussed at length throughout this thesis. The case studied revealed that – depending on the size of the project and the resources able to be dedicated to sustainability – a sustainability advisory team consist of various specialists covering the different sustainability themes. For example, in GHG assessment or social issues, as well as a governance specialist. It is also useful to have sustainability advisers or at least ‘champions’ who work in the design and procurement teams, as this would help ensure the approach is thoroughly embedded in these processes.

Also, having leadership-level commitment is critical – and even where there is existing appetite, this should be fostered and enhanced throughout project delivery by the sustainability advisers. Having clear lines of responsibility, accountability and decision-making authority for infrastructure sustainability from the upper echelons of management, down to every project team member is ideal. This is the approach taken by ODAT, where every member of the entire project team is responsible for infrastructure sustainability and sustainability outcomes. Ultimate responsibility for infrastructure sustainability then rests with the Director of Transport, and further with the London 2012 Heads of Function and the London 2012 Sustainability Board. This level of accountability for infrastructure sustainability is imperative for the delivery of sustainability outcomes.

The role of sustainability advisers in facilitating an understanding of sustainability, including on the benefits of adopting an infrastructure sustainability agenda, was significant in overcoming some of the challenges presented in the SMA case study in particular – including those relating to procurement as discussed above. Desirable qualities and attributes identified included being tenacious and ‘thick-skinned’, being proactive in engaging with and capacity building different project team members, having the ability to use appropriate and accessible language in expressing the infrastructure sustainability concept and any related technical information, and resourcefulness. Ensuring that sustainability advisers hold such attributes and qualities will necessarily require a sound interview process, whereby the proponent
interviewer will need to ask pertinent, probing questions in order to gauge whether the interviewee does hold those attributes and qualities.

Several deliverables that should be the responsibility of sustainability advisers were identified and incorporated into the framework in Part VI. These included a ‘gap analysis’ of sustainability skills be undertaken at different stages of project delivery; a sustainability resources plan which includes recruitment needs and budgetary provisions; and a roles and responsibilities matrix that formalises the responsibility for sustainability initiatives, targets and outcomes to individuals from each tier of management, as well as to other relevant employees including sustainability advisers.

(d) Decision-Support Tools

Market availability of products and innovative technology is key in selecting and investigating the feasibility of targets and initiatives. Also, the capacity of the local construction industry to respond to sustainability requirements is a critical success factor, as demonstrated by ODA. Early engagement with the supply chain is very important as part of implementing an approach to governing infrastructure sustainability. Further to this, proponents need to be active in developing the skills and capacity of local industry, and overcoming existing barriers including relating to inherent conservatism.

Building this capacity is also important with respect to sustainability-rating tools. As was revealed in the ODA case study, effort and resources are required to achieve a high CEEQUAL score, or even to simply apply the tool. Part of the capacity building of local industry should include ‘up-skilling’ industry to be adept at applying tools such as CEEQUAL and AGIC’s rating tool. Significantly, even if the proponent is extremely creative and innovative in its sustainability requirements, if the industry is not capable of responding to and meeting those requirements, then those requirements simply will not be met.

A significant finding from this research is the need to demonstrate cost effectiveness and value for money of sustainability initiatives. ODA even hopes to develop metrics for quantifying benefits not typically costed, such as taking people out of unemployment. At the early stages of implementing the framework presented in Part VI, demonstrating and getting actual figures where possible around cost savings is imperative – and this will need to take
into account whole-of-life costing. This also has implications for application of CEEQUAL, AGIC’s rating tool or another sustainability-rating tool. If such tools can provide evidence of cost savings that can be achieved through implementation of the tool, this would aid in increasing take up. Other recommendations for these tools are discussed below.

(e) Measuring, Monitoring and Reporting

The importance of measuring, monitoring and reporting was discussed above in the context of providing assurance that sustainability commitments are being delivered. Due to the timing of the deferral of the Sydney Metro project, ODAT provided more insights into this issue, although SMA did have certain ‘plans’ for its process including ongoing revision and updating of targets to reflect legislative and other changes to drive continuous improvement.

ODAT’s measuring, monitoring and reporting process includes various reporting procedures both internally and externally, including monthly reporting on a web-based system with a cross-cutting theme of sustainability, and Quarterly Transport Sustainability Reports which address the three headline themes of inclusion, healthy living and climate change. These reporting requirements are linked to ODAT’s SuMS, which includes program sustainability audits and second-party assurance, for example through reviews by the Commission for a Sustainable London 2012. While other infrastructure projects or project programs might not be large enough to have a separate external assurance body like the Commission, there is still opportunity to seek external assurance through existing organisations such as interested non-government organisations.

Communicating with external stakeholders on infrastructure sustainability, outcomes and commitments is a critical part of ODAT’s process, evidenced in the sustainability-related material available on the London 2012 website. Utilising the communications team to communicate with external stakeholders on infrastructure sustainability is a good approach being spearheaded by ODA. Individuals in that team will likely be adept at meaningfully engaging and communicating with external stakeholders on infrastructure sustainability, ideally generating community support.
(f) Knowledge Sharing and Capacity Building, and Legacy

The research findings include the identification of two aspects to knowledge sharing. The first is knowledge sharing within a project across different work streams, which pertains to internal collaboration, participation and engagement. This can facilitate infrastructure sustainability and outcomes. The second aspect of knowledge sharing is from project to project, and across industry at large. This latter aspect should be formalised through a process for capturing lessons learnt, from other projects to the project in question, and vice versa, and then to industry at large.

Building a culture of sustainability is also important and links to the concept of legacy. Achieving organisational change was identified as key to advancing infrastructure sustainability and promoting an infrastructure sustainability agenda. This is particularly important in terms of the urban rail sector which as discussed is inherently conservative – a key barrier to achieving the kind of innovation and change needed for infrastructure sustainability. The case studies also indicated that capacity building of internal and external stakeholders can be done actively such as through workshops, and can occur by default through experience gained ‘on the job’.

This capacity building and knowledge sharing leads to legacy outcomes, as employees can take lessons learnt and any new skills and experience in infrastructure sustainability to other projects, to their organisations and to the community. Legacy planning and outcomes were a key commitment of ODA and ODAT, and appears to be a constant consideration in infrastructure project delivery-related decision-making. The notion of ‘legacy’ was even embedded in relevant procurement documentation. The author raised the possibility of using the term ‘legacy’ as a more accessible term to express and communicate sustainable development, infrastructure sustainability and other variations of the concept. Research into the viability of this would need to be conducted, for example through qualitative research methods constructed to assess the utility of the term.
D Recommendations for Further Research

This section discusses opportunities for further research that will i) help address the unavoidable limitations associated with this research, ii) likely produce interesting, contemporary and useful research outputs, and iii) enhance the applicability of the framework. This discussion is also undertaken in recognition that in any research project there will be opportunities for improvement and further testing of research outputs. The recommendations presented below add to those recommendations already outlined in Section C above.

The main limitation of this research is associated with the deferral of the Sydney Metro project in the midst of the research program. This was a major event in the external context of this thesis, and it had implications for data availability, namely on infrastructure sustainability governance components relating to later stages of project delivery. However, the author accommodated the associated challenges and implications, including by discussing with SMA interviewees their intended or planned approach to – for example – measuring, monitoring and reporting.

Despite its deferral, it is evident from Part III and subsequent analysis throughout this thesis that SMA had developed a sophisticated approach to governing infrastructure sustainability that is still being held up as best practice within the industry. Hence it is important that the experience of SMA is shared with the academic community through this thesis, so that the considerable knowledge gained and effort put into developing the approach is not lost – that it has ongoing legacy implications. However, a key unavoidable limitation relates to the inability to assess whether the approach was effective in the long-term – research which can be undertaken for ODAT as discussed above. However, data on other aspects of the approach was plentiful and added significant value to the development of theory and the subsequent framework found in Part VI.

Much of the analysis and theory – and subsequent framework developed based on this theory – relied on interviewee responses and views on the respective case study approaches to governing infrastructure sustainability. While this interview process proved fruitful, further research could take it one step further and investigate the impact that different disciplines has
on the take up of an infrastructure sustainability agenda. This research has referred to some possible trends – for example where the procurement team was generally unwilling to adopt or uncertain of infrastructure sustainability – which should be further explored and which would aid industry in targeting certain disciplines for capacity building activities and programs.

Interviews with more representatives from the bidding consortia for the Integrated Metro Operations (IMO) and Permanent Route Infrastructure (PRI) contracts in the case of SMA, and the design and construction contractors for ODAT’s West Ham project, would also have been beneficial. For the SMA case study, only one interviewee (SS4) was able to be sourced and interviewed due to time constraints. More interviews would have allowed for a better understanding of the tenderers or contractors’ perspectives on the sustainability requirements; and of how prepared and confident those contractors felt in responding to those requirements.

As discussed, the interface between procurement processes and effectively governing infrastructure sustainability was found to be significant. This significance warrants further exploration. Further research could explore other provisions in procurement processes and in contractual arrangements from a contract law perspective, because this area is still underexplored in the literature. This could include, for example, investigating the most effective penalties for breaching any conditions relating to sustainability commitments, while at the same time encouraging innovation through contractual arrangements. Also, limitations and opportunities in terms of infrastructure sustainability presented by the delivery method and contract type should be further investigated. For example, research could undertake a comparative study between alliance, public private partnership (PPP) and design and construct contract types.

Again in terms of procurement processes, further research could explore how to make sustainability a key tender evaluation criteria or ‘centre piece’ in procurement processes. As discussed, a complete analysis and re-design of conventional procurement processes so that sustainability is inherent and the ‘centre-piece’ (including in decision-making/evaluation criteria), as opposed to integrated, would be groundbreaking and is a good topic for further research and practice.
As discussed above, there is a need to further expand on the work done in this thesis and undertake a post-construction and operations review of actual benefits associated with ODA and ODAT’s sustainability activities. This should include judging whether ODA’s Learning Legacy Programme has achieved a culture of sustainability on ODAT’s projects and within ODAT’s project team; or whether other capacity building and knowledge sharing techniques are resulting in legacy outcomes, and what that legacy ‘looks like’. It should also include a review of the success or otherwise of the CompeteFor website and accompanying processes. Such a post-construction review will assist in judging the long-term effectiveness of the approach to governing infrastructure sustainability. This recommendation links to recommendations for CEEQUAL, AGIC’s rating tool and other such tools as discussed briefly above and in the next section.

It would also be fruitful to undertake more case studies on infrastructure sustainability governance approaches where projects are delivering outstanding sustainability performance. A good source of potential case studies would be from CEEQUAL, AGIC’s rating tool or other tool such as Envision in the U.S, where an infrastructure project or facility has achieved a high score or rating. These case studies could then be compared and contrasted with SMA and ODAT’s approaches, and the framework. This research activity would either support or challenge certain components of the framework in Part VI, and ultimately enhance its applicability.

The framework itself should be further trialled and tested on other urban rail, and potentially other, infrastructure projects (from other sectors) to further improve its applicability at a broader scale. This could include a comparative study of infrastructure projects in developing and developed countries to examine how different economic, social (including cultural) and environmental conditions influence the structure of an approach, or indeed the appetite for it in the first instance. Ideally, this ‘testing’ should be undertaken through academic research that is grounded in the realities of real-life infrastructure projects. This will improve the ability to make industry generalisations based on further testing. It will also advance the theory presented in this thesis, and serve in updating the framework.

A final area for further research is the exploration of effective cultural change strategies for advancing infrastructure sustainability in the urban rail sector specifically, but also in the
context of construction companies operating in the infrastructure space more broadly. Research into the dynamic between the ‘top down’ leadership-level drive for infrastructure sustainability and the ‘bottom up’ or non leadership-level drive in the context of the urban rail sector, and the infrastructure industry more broadly, would also be appropriate.

E Recommendations for CEEQUAL and AGIC’s Rating Tool

This thesis explored in some detail the ability of CEEQUAL and potentially AGIC’s rating tool to achieve sustainability outcomes. However, further research is required into the actual benefits of applying CEEQUAL or other tool post-award. As discussed, but more specifically, further research should investigate the ability of tools such as CEEQUAL to actually drive outstanding environmental, social and economic performance, through for example detailed case studies of projects in terms of the specifics involved – and long-term outcomes associated with – tool application.

The ODAT case study indicated that CEEQUAL can be laborious. Building a prioritisation process into CEEQUAL and potentially AGIC’s rating tool – in addition to existing scoping out provisions – would yield more targeted outputs and be less onerous. For example, by ranking the importance of a sustainability theme including objectives and possible outcomes, the proponent can ascertain which issues it has the most capacity to influence, and where it can yield the best outcomes, as well as where it should target its available resources. Such a prioritisation process would clearly have to be accompanied by a strict verification process and assurance to stakeholders that the proponent is not simply ‘watering down’ its sustainability commitments. Such a process therefore requires further exploration.

Provision for on-going monitoring and measuring to see if the score is in fact warranted in the long-term should be built into CEEQUAL and AGIC’s rating tool. This is a key issue, particularly for issues around socio-economic advancement such as long-term employment opportunities to be provided or facilitated by a project. This has links with the above recommended research using case studies that reveal the actual benefits of using these tools.
post-award. Penalties for not seeing through certain sustainability commitments post-award should be devised, including the potential to revoke the award.

CEEQUAL and AGIC’s rating tool should be accompanied by adequate guidance on how to effectively govern infrastructure sustainability. Any supporting references should be continually updated to reflect recent and leading activity in this area. For example, case studies on approaches could be included on the CEEQUAL website, as well as links to this thesis and associated publications, and any other relevant studies that emerge. Also, BS 8901 could be referenced on the CEEQUAL website as a possible high-level specification for developing a governance approach.

The same advice can be given to AGIC. AGIC includes a section on its website called the Knowledge Hub that includes information resources such as project sheets, presentations, articles and conference proceedings, separated under the various themes. Outputs from this thesis are currently being uploaded to the Knowledge Hub with the specific intention of providing guidance on how to effectively govern infrastructure sustainability. Further, category 1.1 management systems within theme 1 of AGIC’s pilot rating tool includes a case study on ODAT’s SuMS – information on which was provided by the author to AGIC during the peer review process.\(^\text{1040}\) The author plans to continue her close relationship with AGIC and undertake further work in the ongoing development and updating of the governance theme in particular. This will likely include further academic research, where some of the recommendations for further research provided in this thesis are taken up by the author.

\section{Applicability of Framework}

The framework presented in Part VI includes the key stages and steps to developing and implementing an approach to governing infrastructure sustainability. The framework is based on the comparative study where each case study approach was discussed, challenged and improvements suggested based on existing theory found in the literature. Hence, the
framework comprises a novel approach to governing infrastructure sustainability that builds and improves upon each case study approach.

Figure 10 provided an overview of the framework stages and steps, and at what stages of project delivery they ideally or likely relate to. In the development and presentation of this framework, a key thesis objective of developing a framework for governing infrastructure sustainability that addresses the gap in the literature has been met.

However, there is a need to further demonstrate the practical applicability of the framework. Recommendations for improving its applicability were provided above. However, the utility of the framework has already been demonstrated in the work the author has been doing in her capacity as a sustainability adviser. The key findings and components of the framework are being applied to client work, including with urban rail project proponents, but also proponents in other sectors. Through this process of implementing the framework, the author appreciates that the framework is somewhat detailed and descriptive, but that this level of detail is suitable in a research context and hence for this thesis. The framework is therefore an essential underpinning of a simpler adaptation that allows for a great deal of flexibility, so that it can be used on infrastructure projects from a variety of sectors.

Reflecting on the applicability of the framework, the author again acknowledges that the framework may not be the only suitable way to govern infrastructure sustainability. Other proponents and their delivery partners may have achieved sustainability outcomes using other infrastructure governance techniques and processes. The framework is, however, a highly promising approach for encouraging infrastructure sustainability and achieving sustainability outcomes and should be trialled on other infrastructure projects and explored further as part of academic research, as discussed.

The utility of the thesis more broadly has also been demonstrated in the author’s role in the development of AGIC’s governance theme as part of its rating tool. In fact, as stated above, category 1.1 management systems includes a case study on ODAT’s SuMS and the case study is based directly on this research. Consequently, the author is confident that this research is already making a difference and contributing to a ‘step change’ within industry to address infrastructure sustainability, which was a key aim in terms of its contribution. The contribution of this thesis to rating tools such as CEEQUAL is also demonstrated above in
recommendations for further research. Finally, it is hoped that contribution to the academic realm has been fulfilled with several conference presentations and journal articles resulting from this research. Academic research should continue to investigate this important and timely research topic by building on the key findings of this thesis and the framework – recommendations for which are provided above.

It could be argued that infrastructure sustainability does not require a separate (albeit integrated) approach or management system – that it should be inherent in all project delivery stages, systems and processes. In this circumstance, sustainability objectives and targets would be embedded in these other systems and processes, for example the design management plan, and not appear in a separate sustainability plan or system. While this might be attractive because it means that there is not another plan or system for the project team to ‘deal with’, this research has demonstrated that i) the industry is not currently at a point where existing, business as usual systems and processes can be relied on their own to deliver the beyond compliance and innovative outcomes inherent to infrastructure sustainability (and because it is about going ‘above and beyond’, infrastructure sustainability needs to be actively managed to ensure initiatives are not ‘cut out’), and ii) best practice – at least in the urban rail sector – as demonstrated by this research is having a separate but integrated approach to governing infrastructure sustainability (albeit that further research should confirm this generalisation). The case for the framework presented in this thesis is therefore sound.

The framework does not address the pre-feasibility and concept (or project development) phase, or political planning processes, where the type of project to address an infrastructure ‘need’ is selected and project funding is sought. Clearly – and as discussed earlier in this thesis – such processes are fundamental to the achievement of sustainable development. For example, it could be argued that at face value, selecting a public transport project over a road upgrade is a more ‘sustainable’ choice of infrastructure facility to address a transport need. However, there is still a need to ‘drive’ an infrastructure sustainability agenda through later stages of project delivery and facilitate infrastructure sustainability and sustainability outcomes. And indeed the vision and values established for a project at pre-feasibility and concept, for example in the business case, can and should be realised through the sustainability objectives and targets that form part of the approach to governing infrastructure
sustainability. Any project development and project delivery sustainability activities will then need to be followed through into the operational phase of the infrastructure facility, so that the whole life of the facility can be accounted for.

The importance of the project development phase for sustainable development indicates that coupling the framework presented in this thesis with an infrastructure facility planning and selection process that has at its core the pursuit of sustainable development will likely yield outstanding sustainability outcomes. As stated, this is because greater opportunities for sustainability are likely to be at the project development phase. However, it is acknowledged that even greater opportunities lie at pre-project development stages of growth management policy making and strategic planning where many alternative paths can be deliberated on, including ones with infrastructure components.

Overall, there is a big task at hand. However, the critical role of the pre-project development phase reveals another area requiring further research and broader industry and governmental efforts, namely the need for legislative and fiscal change to cope with ever depleting natural resources, population growth and an uncertain future. Clearly, the attainment of such a highly desirable outcome is beyond the scope of one thesis alone. However, through a concerted, coordinated effort that brings together knowledge and experience from academic institutions, industry (and in particular the sustainability advisory profession), government and non-government organisations – the achievement of sustainable infrastructure facilities in a holistic and strategic sense will become increasingly viable. This thesis plays a role in that concerted effort, and the outcomes and recommendations presented here should be taken onboard across the infrastructure industry at an international scale.
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APPENDIX I

A  Round One of Interviews

**Table 6** – Disciplines and indicative job titles of individuals interviewed in the first round of interviews.

<table>
<thead>
<tr>
<th>DISCIPLINE</th>
<th>JOB TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Project management</td>
<td>• Board member of a rail authority</td>
</tr>
<tr>
<td>&amp; Leadership</td>
<td>• Member of an alliance leadership team</td>
</tr>
<tr>
<td></td>
<td>• Alliance management team member</td>
</tr>
<tr>
<td></td>
<td>• Project Director</td>
</tr>
<tr>
<td></td>
<td>• General Manager Planning Approvals</td>
</tr>
<tr>
<td>2  Environment &amp; Planning</td>
<td>• Planning and Approvals Manager</td>
</tr>
<tr>
<td></td>
<td>• Environmental Compliance Manager</td>
</tr>
<tr>
<td></td>
<td>• Director of Environmental Constancy</td>
</tr>
<tr>
<td></td>
<td>• Proponent* Environment Manager</td>
</tr>
<tr>
<td></td>
<td>• Construction Environment Manager</td>
</tr>
<tr>
<td>3  Sustainability</td>
<td>• Proponent Sustainability Manager</td>
</tr>
<tr>
<td></td>
<td>• Proponent Sustainability Director</td>
</tr>
<tr>
<td></td>
<td>• Senior Sustainability Consultant</td>
</tr>
<tr>
<td></td>
<td>• Senior Sustainability Consultant II</td>
</tr>
<tr>
<td></td>
<td>• Sustainability Director</td>
</tr>
<tr>
<td>4  Engineering &amp; construction</td>
<td>• Design Engineer</td>
</tr>
<tr>
<td></td>
<td>• Design Engineer II</td>
</tr>
<tr>
<td></td>
<td>• Design Manager</td>
</tr>
<tr>
<td></td>
<td>• Design Manager II</td>
</tr>
<tr>
<td></td>
<td>• Construction Project Manager</td>
</tr>
</tbody>
</table>

*'Proponent’ indicates the interviewee is an employee of a proponent or client organisation as opposed to a consultancy or other organisation.
### Case Study Interviewee Coding Protocol

**TABLE 7** – SMA case study interviewees and coding protocol

<table>
<thead>
<tr>
<th>NO.</th>
<th>GROUP NAME</th>
<th>CODING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environment and planning discipline</td>
<td>SE1, SE2</td>
</tr>
<tr>
<td>2</td>
<td>Sustainability advisory discipline</td>
<td>SS1 – SS4</td>
</tr>
<tr>
<td>3</td>
<td>Design discipline</td>
<td>SD1, SD2</td>
</tr>
<tr>
<td>4</td>
<td>Leadership level</td>
<td>SL1 – SL3</td>
</tr>
<tr>
<td>5</td>
<td>Regulators</td>
<td>SR1</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>12 interview participants</strong>*</td>
</tr>
</tbody>
</table>

*Ethics approval number H7609 from the Human Ethics Committee at the University of Western Sydney.

**TABLE 8** – ODAT case study interviewees and coding protocol

<table>
<thead>
<tr>
<th>NO.</th>
<th>GROUP NAME</th>
<th>CODING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environment and planning discipline</td>
<td>OE1</td>
</tr>
<tr>
<td>2</td>
<td>Sustainability advisory discipline</td>
<td>OS1, OS2, OS3</td>
</tr>
<tr>
<td>3</td>
<td>Design discipline</td>
<td>OD1, OD2</td>
</tr>
<tr>
<td>4</td>
<td>Leadership level</td>
<td>OL1 – OL3</td>
</tr>
<tr>
<td>5</td>
<td>Regulators</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>9 interview participants</strong>*</td>
</tr>
</tbody>
</table>

*Ethics approval number H7609 from the Human Ethics Committee at the University of Western Sydney.
C Interview Questions Pro-forma

1. Please outline your background, roles and responsibilities on the project.
2. Where has the appetite for infrastructure sustainability practice and outcomes on the project come from?
3. How is sustainability being governed on the project e.g. relationship to AGIC/CEEQUAL tools’ project management categories and sub-categories?
4. What are some of the key challenges associated with the approach to governing infrastructure sustainability, and how were these challenges overcome?
5. What tools did/do the key decision-makers need to make informed decisions on infrastructure sustainability practice e.g. cost benefit analysis?
6. What would you like to see, or what would you do, differently next time in relation to an approach to governing infrastructure sustainability?
7. Can you recommend other people for me to speak to in relation to this case study?
APPENDIX II

A Sydney Metro Authority Maps

**FIGURE 12** – The proposed Sydney Metro Network\(^{1041}\)

\(^{1041}\) Taken from the Sydney Metro Authority, above n 163, 2.
FIGURE 13 – The proposed route of the CBD Metro

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1042 Ibid 8.
Figure 14 – Location of the Orient Way project in the context of the Olympic Park

Taken from the Olympic Delivery Authority, above n 197 (no page numbers).