

THE  
**ASSET**  
JOURNAL

DECEMBER 2022

ISSUE  
**04**

Volume 16



ASSET MANAGEMENT COUNCIL

**ASSET MANAGEMENT  
IN SUSTAINABILITY AND  
RESILIENCE**

Mining decarbonisation  
through improved fleet  
selection

The role of embodied energy  
in lifecycle modelling towards  
a zero emissions future

Successful asset management  
actions to assess and increase  
resilience to climate change  
with practical guidance from  
lessons learned

Sustainable asset  
management: customising  
bridge inspections to better  
manage maintenance and  
capital spend in a resource  
dependent environment

# CONTENTS

|  |    |
|--|----|
| <b>Editors Column</b>  | 3  |
| <b>From my desk:</b> National Chair's Letter   | 4  |
| <b>Today's Decisions for Tomorrow's Outcomes:</b><br>Romilly Madew, CEO Engineers Australia  | 5  |
| <b>Article 1.</b> Mining decarbonisation through improved fleet selection, Vaishnav Sundara Rajan  | 9  |
| <b>Article 2.</b> The role of embodied energy in lifecycle modelling towards a zero emissions future, Darren Chuang  | 13 |
| <b>Article 3.</b> Successful asset management actions to assess and increase resilience to climate change with practical guidance from lessons learned, Michael Bilney                     | 19 |
| <b>Article 4.</b> Sustainable asset management: customising bridge inspections to better manage maintenance and capital spend in a resource dependent environment, Dr Susan Rebaño-Edwards | 24 |
| Star Profile - John Kirwan CAAM  | 29 |
| Star Profile - Truong Van Nguyen CPAM  | 31 |
| Star Profile - Daniel Kelleher CSAM  | 32 |
| <b>International Day for Disaster Risk Reduction:</b><br>Resilience Planning   | 39 |
| Chapter News   | 40 |
| <b>TC-251 update (ISO550xx):</b> Martin Kerr   | 43 |
| New Members  | 46 |
| Membership Application   | 49 |
| Corporate Partners and Corporate Members   | 51 |

**Publisher:** The Asset Management Council

**Chief Editor:** Ernst Krauss

**Publication Design:** Heidi Robinson

ISSN: 1834-3864

For all enquires please contact:

**publications@amcouncil.com.au**

Asset Management Council

PO Box 2004 Oakleigh Vic 3166

Tel 03 9819 2515



ERNST  
KRAUSS

EDITOR IN CHIEF

## THE ASSET, DECEMBER 2022

**Sustainability concerns us all. It may be for manufacturing businesses the ability to manage waste and be efficient in the use of increasingly rare raw materials and to embrace recycling of materials in the generation of new products. The consumers, as stakeholders in the need for products, can also play their role in for instance demanding products that are repairable and recyclable. Sustainability has gained a very high profile, not least due to the United Nations 17 Sustainability Goals. While these are aspirational and strategic for National consideration, there are a number of those goals that Asset Management directly addresses and supports. These are some of the obvious examples and without claim to completeness: goal 6- Clean Water, goal 7 – Clean Energy, goal 8 – Decent Work and Economic Growth, goal 9 – Industry, Infrastructure and Innovation, goal 11 - Sustainable Cities and goal 12 – Responsible Consumption and Production.**

But what does that mean for an Organisation that implements / operates an Asset Management System? No doubt many Businesses are today considering some of the above goals because they are either becoming policies in many Countries or by exercising 'good corporate citizenship'. Those that operate an Asset Management System may be challenged by the need to create a sustainable Asset Management System. Sustainability is among other things the ability to maintain and sustain a process in time. Perhaps it is then desirable to not only look at the big goals but start at the organisational level and work upwards to achieve defined greater goals.

Such an approach no doubt is one required input to the development and sustainment of an Asset Management System. Industrial and Infrastructure development and improvement will need to sustain their processes with a view of meeting changing resident's demand. We already have examples from Overseas that Businesses and Councils structure their Strategic Asset Management Plans to incorporate changing energy sourcing into their long term capital or portfolio management. Of course, this is an essential aspect of a SAMP.

Sustainability likewise refers to individual Asset Management Systems. In some cases, especially reported overseas, early adopters of Asset Management Systems have failed to treat Asset Management as an evolving process that requires management to become sustainable. This was especially notable with Organisations whose AM System was certified to ISO 55001 and found themselves out of compliance with Certification upon renewal.

In my view, the term sustainability requires careful consideration how it applies to strategic and operational sustainability of individual organisations, which areas of economical, societal and corporate responsibilities are to be addressed. When the required processes are defined, they need to be regularly audited and improved to keep pace with current developments and requirements. Sustainability therefore seems to me to be a Leadership as well as workforce responsibility to ensure that systems, businesses and societies can adapt and respond to remain viable.

Perhaps you find stimulation to review this important topic for your organisation? We are certainly interested to hear your views on this important subject.



## FROM MY DESK: CHAIR'S LETTER

**NATIONAL CHAIR,  
TOBY HORSTEAD**

**I opened the recent Asset Management in Government Symposium, where the theme was today's decisions for tomorrow's outcomes, asking "how can we change our thinking and approach to assure public assets will deliver the service and community benefit for following generations?" and appealing that "We must think beyond the build of today to the sustainability and resilience of assets for the future."**

My perspective is that as an industry we would do well to focus on assurance (giving and receiving), and more importantly capability building. Public asset owners should be investing in their organisational capability, and industry should be focused on providing enduring uplift in knowledge and management system improvement, not just providing reports.

Jim Betts, Secretary for the federal Infrastructure, Transport, Regional Development, Communications and the Arts Department, recently highlighted the need for the federal government to be an informed investor and talked about investing in resilience, decarbonisation and capability building. During that presentation Jim identified the value of long term asset management and noted that for that for asset managers 'your time has come'.

Our industry has such an important role and opportunity to help define and understand the future, the need for assets, and the outcomes required. Despite being in drought not so long ago should we have predicted the rains to come on the cycle of La Nina and raised the dam walls, should we have moved communities already? Asset Management approaches, knowing the assets and understanding the outcomes, are so important to making our future more sustainable and resilient.

The theme for AMPeak 2023 in April in Sydney is "Collaboration through Asset Management". This collaboration

was evident at the recent Exchange weekend where our Chapter and Special Interest Group leaders came to together with the Board to consider the local and global landscape and plan the forward technical program.

I am enthused by the growing diversity of approach and thinking within the asset management community. I know we have active participation from change managers, economists and financiers, information specialists and also those with psychological training. Perhaps this is part of the doing things differently and making decisions today with the future outcomes in mind.

This is aligned with no longer being constrained by 'physical' in our asset thinking, and we should further stretch our profession to intangibles and community value, and perhaps management systems more generally.

As we look to the future, I must say thank you to Engineers Australia's CEO Romilly Madew for opening the Symposium, thus strengthening our relationship. Engineers Australia is very important to our foundations; and maintenance engineering is in the DNA of the Asset Management Council. Our role as a Technical Society of Engineers Australia is important, and as a professional body we provide that holistic management system / outcome focused voice for the Asset Management Area of Practice. More broadly we represent and provide support on engineering asset management across all Engineering Communities.

In a world of constant change, and the known and the unknown challenges, organisations will benefit from established, communicated, integrated and operationalised management systems. This will position organisations to be agile in their response to the challenges and disruptions of the day, whether that be pandemics, economics, climate or political impacts.



# ROMILLY MADEW

**CEO ENGINEERS AUSTRALIA**

## TODAY'S DECISIONS FOR TOMORROW'S OUTCOMES

### Introduction

I have recently commenced as Chief Executive of Engineers Australia – the peak body and voice of the engineering profession.

We publicly advocate for the importance of engineers and engineering in creating a sustainable, safe and successful future for our nation. Of course, asset management is an incredibly important part of this – particularly in this 'new normal' where we seem to face rapid and constant change. By that I mean the major shifts we have seen in technology, consumer preferences, climate, patterns of trade and the geopolitical landscape.

Growing social, economic and environmental interdependencies are bringing added complexity to the planning, delivery and operation of our infrastructure. Not to mention the pandemic, which altered the demand profile of Australia's infrastructure across all sectors – as well as our ability to understand and plan for our future needs. Anticipating and mitigating against ever-changing risks to infrastructure is becoming increasingly difficult – particularly as our assets and networks are becoming more connected and more complex.

Governments around Australia are beginning to advance their efforts and improve their maturity in asset management – whether it be in transport,

energy, telecommunications, water or social infrastructure. This progress should be accelerated through investments in capability, capacity, systems, processes and technology – to generate social benefits as well as positive economic outcomes.

And it is with this in mind that I want to acknowledge the significant work of the Asset Management Council in progressing the asset management industry both nationally and abroad. As a Technical Society of Engineers Australia, the Council makes an invaluable contribution. It has been essential in advancing the profession, building capability and creating knowledge sharing opportunities like the recent Asset Management Government Symposium. The Symposium creates an important opportunity to hear experiences and challenges with implementing Asset Management in government – To share knowledge, and to learn more about how we can plan and make decisions today, to benefit our communities in the future. This is how we shift the dial and deliver better outcomes, for everybody's benefit.

I would like to highlight some of the reform opportunities to enhance productivity across the sector and consider three key themes from a recent report released by Engineers Australia, called *Enhancing productivity in infrastructure delivery*.

In particular, highlighting:

- The importance of good project governance and planning
- The need to embed risk management across the project lifecycle and
- The opportunity of digital infrastructure and innovation.

### **The importance of good project governance and planning**

When we think about asset management and its role in delivering for ‘tomorrow’ – good project governance and planning will be key. There are two key parts to this, both with broad implications for asset management in the public sector.

#### Governments Role

**Firstly**, there is an important role for government in committing to collaborative, long-term planning of infrastructure. Australia is relying on governments to improve the management of project pipelines to boost our economy in the wake of the COVID-19 pandemic and to ensure we are future-ready. Of course, Australia is also in the midst of an unprecedented wave of investment in public infrastructure projects. Investment in major public infrastructure over the next five years will exceed \$218 billion.

Importantly, this investment by Australia’s governments will lay the foundation for future

economic growth and lift our standard of living.

However, this wave of investment has put significant pressure on the sector, and contributed to localised shortages of skills and materials – which are being felt acutely, particularly in engineering. Over the next two years, Infrastructure Australia has estimated that a further 41,000 individuals are needed to fill engineering roles - including in civil, geotechnical, structural and materials engineering. It is a problem that has been decades in the making – made worse by an increase in demand for engineering skills and international border closures which limited skilled migration.

So there is a very live challenge for governments to coordinate the national investment portfolio more effectively to ensure that we can deliver everything we want as a country within the resources available.

In this context, collaborative, cross-sectoral, long-term planning of infrastructure is critical to sustainable economic prosperity. But this should be underpinned by a culture of continuous improvement – and by that, I mean a focus on achieving best-practice project governance, planning, procurement, and delivery.

For example, investment decisions should consider and reflect the whole-of-life costs of an asset. Quality evidence-based decision-making requires a comprehensive understanding of whole-of-life cost, functionality, performance and condition.



# ROMILLY MADEW

## CEO ENGINEERS AUSTRALIA

All these factors form the basis of quality asset management, in line with international standards.

### Project Governance

**The second point** I want to underline around project governance is its relationship to sector productivity. The productivity challenge in construction and infrastructure is well-established. Over the past 30 years, the sector has become 25% less productive compared to mining, manufacturing, retail and transport. In our view, there is an important and interdependent relationship between productivity and resilience. And productivity within the sector is likely to decrease without a concerted effort to improve the resilience of current and future infrastructure.

Resilience goes further than just extreme weather events, and also includes supply chains, skills and cyber threats.

Investment, both monetary and time, in rebuilding and repairing damaged or offline infrastructure prevents the development of new capabilities and hinders growing demand by delaying other projects.

Change is required to focus on longer-term decision-making processes which are clear and comprehensive and recognise the future value derived by focusing on sustainability and resilience.

The sector must better communicate the desired outcomes of projects and embed sustainability,

resilience and circular economy principles at all stages of the asset lifecycle.

We support a systems approach to resilience, starting with developing a nationwide understanding of the risks being faced, and sharing accountability across government and industry.

I want to turn now to the importance of embedding risk management right across the project lifecycle.

### **The need to embed risk management across the project lifecycle**

Major infrastructure projects are complex, lengthy and involve many diverse stakeholders at various stages of the project lifecycle. Many of these projects are plagued by significant time delays, cost overruns, failed procurement, or funding difficulties. But many of these issues can be avoided through better risk assessment in the initial project phase. As many would appreciate, this is important to lay the foundation for successful asset management.

While some appetite for risk is necessary to encourage innovation, we often see risk analysis underdone at various stages of the project lifecycle and value chain. What is needed is continuous risk-management practices to monitor and control risk at each critical stage. Part of this is considering the appetite and capability of potential asset owners to absorb risk. It is also important for stakeholders to be engaged early and often to ensure responsibility and accountability throughout the project lifecycle.

Inappropriate allocation of risk undermines the professional indemnity insurance market, and breeds instability in the market.

To set ourselves up for the future, risk management practices must be embedded into business-case planning and project lifecycle processes – With the onus on all stakeholders to monitor, control, mitigate and report on risks at each critical project stage.

### **The opportunity of digital infrastructure and innovation**

The last key theme is digital infrastructure and innovation. This is such an enormous opportunity for the asset management industry.

Broad uptake and use of digital technologies at all phases of asset lifecycles will enhance productivity in infrastructure delivery and operation. There is a clear opportunity for technology to revolutionise the productivity of the sector. And there is so much incredible work happening in this space.

The use of technology has numerous positive impacts on the sector. From enabling more collaboration and coordination between teams and stakeholders to increasing innovation through improved data capture, and providing a more detailed view of asset performance.

Greater investment in new technology, such as digital twins, smart sensors, building information modelling systems, digital engineering, and digital asset management tools, will ensure Australia is future ready and that our infrastructure can be managed sustainably and effectively.

But there is still a need for government leadership.

Greater emphasis must be placed on integrating nationally consistent digital approaches to

infrastructure project planning and operations. This must occur now if Australia is going to be ready for the demands of the future.

That is why Engineers Australia is advocating for the establishment of a unit focused on Australia's digital infrastructure future to support agile development and the rollout of digital infrastructure tools.

In the context of skills and labour shortages, we also need to think about the workforce of the future.

In particular, we want to see governments allocate funding for training and upskilling the labour force. And more investment in programs that promote collaboration between industry and academia and encourage greater integration of current and emerging technologies. This will enable vital professions like Asset Management to make an even greater contribution in supporting a sustainable, liveable and productive Australia.

### **Concluding remarks**

We know that high-performing assets are essential for our communities, our economy and our future prosperity.

There are significant opportunities for reform to enhance productivity and outcomes across the planning, delivery and operation.

When listening to some of the leaders in public sector asset management, keep in mind that we all have a role to play in embracing these opportunities and delivering better outcomes for 'tomorrow'.



# ARTICLE 1 – Mining Decarbonisation through improved fleet selection

Vaishnav Sundara Rajan, Aurecon

## ABSTRACT

The aim of this paper is to describe the asset selection and implementation approach that several resource companies use to identify, select and deploy suitable Heavy Mobile Equipment (HME) production fleets with a reduced environmental impact. In addition to reduced carbon emissions, this approach has resulted in savings associated with lower maintenance requirements, lower capital development costs and decreased operational risk. This paper also presents the key success factors that underpin a successful asset selection process. Alignment to these factors will enable any organisation to achieve similar successful economic and environmental outcomes in their asset selection process.

**Keywords:** Asset, Performance,

Management, Framework, Improvement, ISO55001, Lean Six-sigma

## BACKGROUND

A majority of mining companies globally have presently committed to achieving net zero on or before 2050. Achieving this will require an examination across mining operations with a view to reduce carbon emissions. Hauling is currently the single largest contributor to Heavy Mobile Equipment (HME) emissions globally across all mines at ~68 Mt p.a., while loading is the second largest at ~30Mt p.a. 45% of all diesel used on a typical mine site is due to load and haul operations. In Australia alone, mine sites typically use 5 billion litres of diesel every year across load, haul and other activities. Even to meet the minimum

targets of a temperature rise no higher than 2°C, CO<sub>2</sub> emissions from must decrease by at least 50% from their 2010 levels before 2050.<sup>1</sup>

In addition, the demand for commodities is likely to rise with increased demand for goods and services. For instance, between 1995 and 2013, every 1% increase in GDP resulted in ~2% increase in the production of metals<sup>2</sup>. This trend is thus likely to further exacerbate emissions, increasing the importance of focusing on lower and zero emission HME assets early.

In this midst of these factors, the selection of load and haul HME is a key decision that can significantly impact a site's ability to meet its production targets, thus affecting its overall profitability and business viability. Given the cruciality of

this decision, mining companies are typically biased towards selecting production HME assets with proven performance and similarity to their existing, known fleets. This factor, combined with the lack of supporting electrical infrastructure in many sites, has led to only a small proportion of mining HME, about 0.5%, being electric at present.

Despite this, there is a push towards increased electrification in mining equipment due to the appeal of lower operating costs and potentially greater reliability, resulting from reduced mechanical complexity of the HME asset. Currently there are proven electric powered loading units, while zero emission haul fleets with large payloads, either powered by hydrogen or batteries are imminent.

There is thus a need for a tested, evidence based, systematic and repeatable approach towards identifying and evaluating suitable candidates for the productive HME fleet. Such a process would be used several times during a mine's life to ensure that the HME assets being procured provide the best economic and environmental benefits.

## REQUIREMENT

A structured process to guide the comparison and selection of HME load and haul assets ideally needs to adhere to key design requirements including:

- Adaptability to ensure that only criteria essential for each mine site is factored into the decision making
- Completeness to ensure that quantitative and qualitative

factors are considered in the decision, in addition to ensuring that both immediate (transitional) and long term (differential) risks of any asset acquisition are factored

- Inclusiveness to ensure that internal and external opinions from site and industry SMEs are collected and considered
- Robustness to ensure that every decision is based on evidence that is traceable and validated, as well as ensuring that the process can be repeated as needed based on the latest industry benchmark and OEM information

A process aligning to these design objectives will result in a high level of confidence that the chosen assets will be able to achieve the required level of decreased emissions without compromising safety or productivity.

## APPROACH

To meet these requirements, a staged approach resulting in a multi criteria assessment is used. This approach considers the relative importance of various quantitative and qualitative factors to ensure that the asset selected can achieve the organisation's environment and productivity goals.

### Functional Criteria

Functional criteria are mandatory requirements that every asset candidate has to comply with to be considered as part of the shortlist. Such factors are complex to change and the possibility to change them during the course of the mine's operation is deemed to be low. Thus, the list of such

criteria is quite limited and limited to overarching decisions on mine planning (e.g. Shovel vs Backhoe configuration for loading units)/

Following an analysis of the latest mine plan and current site fleet strategy, the requirements for the asset's minimum performance are calculated. Based on compatibility with existing assets on site, other mandatory criteria (e.g. maximum height for loading units) are determined. A consultation with site and industry SMEs ensures that any other qualitative mandatory criteria are also captured (e.g. cold weather packs for ensuring compatibility at cold sites).

The functional criteria are used to reduce the list of possible candidates by excluding non-viable options.

### Fleet Shortlist

The fleet shortlist reflects the possible list of all assets that could potentially fulfil the site's functional criteria. This shortlist includes assets powered through various forms of energy, such as electricity (mains or battery powered), diesel and in the future, hydrogen.

### Decision Criteria

Decision criteria are inherently differentiating factors of each asset that are deemed to be of significant value. These factors are thus used to comparatively evaluate various HME options for the load and haul fleet. Unlike functional criteria, decision criteria are not mandatory and thus failure to comply with them does not in itself exclude an asset from further consideration. However, assets faring poorly on multiple



decision criteria may eventually be ranked near the bottom of the list of options for further consideration.

While the economic viability of each asset is compared through an Equivalent Unit Cost (EUC), decision criteria capture the broader qualitative differentiating factors. This could include factors such as asset and spares lead times for procurement and operator preferences.

### Quantitative Analysis

The equivalent unit cost (EUC) captures the cost of completing one productive unit of a task (e.g. drilling a metre or moving a ton of material). This enables economic comparison of assets on the basis of productivity output per unit of cost incurred.

The EUC is primarily based upon a combination of the asset's expected productivity, capital cost and operating cost, including the cost of carbon. The expected productivity is determined based on the asset's specifications together with operating inputs (e.g. utilisation). While operating inputs are largely influenced by the mine site's current operating parameters, SME input is often used to adjust OEM projections to reflect site realities. Actual quotes from OEMs are typically sourced to ensure accuracy in capital costs. The operating cost is primarily based on the underlying Whole of Life (WoL) cost model that captures the total costs incurred in maintaining the asset over its life, including the cost of all minor and major maintenance tasks, excluding consumables. The cost of carbon is typically factored in as part of determining

the commercial assumptions, with assumptions made for possible future escalations in this cost over time.

### Sensitivity Analysis

To develop further assurance on the viability of each asset candidate, a set of scenarios describing the range of possible changes in each variable is determined through a combination of the organisation's broader economic forecasts, discussions with industry experts and site stakeholders. Alternatively, a pure stress test scenario is also developed to determine the limits of change in one or more variables before the candidate is not economically viable.

Scenario models typically include increases in the cost of carbon. Where there is no requisite infrastructure (e.g. electrical), the first order economic and environmental costs of establishing additional infrastructure are determined and included in the overall analysis.

### Qualitative Analysis

To augment the quantitative analysis, the selection process includes a qualitative analysis that evaluates each candidate asset against the decision criteria. Through engagement with industry experts and peers, including owner operators and contract miners, each asset candidate is examined on its compatibility with other assets on site, strengths, and weaknesses. Qualitative factors that are considered can typically include track record on performance, reliability, strength of the regional supply chain, local support

options, operator preferred features and future proofing technology (e.g. remote and automated features).

### Risk and Opportunity Analysis

While sensitivity analyses primarily capture the risk of changing input variables, a risk analysis seeks to capture the likely challenges presented by each asset candidate in the short term (transition risks) and long term (differential risks). This includes the likelihood of changes in qualitative factors such as the evaluation against the decision criteria. The risk analysis also identifies the possible mitigations that can be enacted to reduce the likelihood and / or consequence of each identified risk.

As opposed to a risk analysis, the opportunity analysis seeks to identify the qualitative advantages posed by each asset candidate relative to the other options. While such opportunities are initially captured qualitatively, a supporting analysis should be conducted where necessary to quantify the impact and be included in the sensitivity scenarios.

### Decision and Implementation

Where several factors influence the final decision, this multi criteria approach may be augmented with relative weightings for each factor. If used, such weightings should be set based on the relative importance of each factor, as determined by collective site and industry SME opinion.

It is to be noted that a number of factors mentioned here are subject to change due to the

dynamic nature of markets. For instance, OEMs may choose to include additional options, offer discounts and other incentives to win customers in the face of competitors. Asset owners must thus be prepared to engage in an iterative selection approach to ensure that they are receiving the maximum value in each asset acquisition. Such a selection process should ideally commence early, be facilitated by experts and supported by a robust set of models and rich library of benchmark data.

With a focus on decarbonisation, OEMs are also offering zero emission versions of proven assets. Where this occurs, asset owners have to weigh the environmental and economic benefits against the incremental risk posed by the difference in technology. This approach ensures that even new models of assets can be effectively evaluated against known and proven options.

Finally, based on the detailed understanding of risks, mitigations and opportunities, a transition plan can be formulated to minimise the transition risks and maximise existing asset value. Specific asset replacement scenarios, supported by Equivalent Annual Cost analyses (EAC) can help determine the optimal asset re- placement points. A well constructed transition plan also includes considerations on training for maintainers and operators as well as the costs and time taken to establish an adequate supply of spares.

## PRACTICAL CONSIDERATIONS

This approach has been successfully used to select load fleets in the resources industry where there is increasing commitment to decarbonisation. Based on lessons learned from several such projects across several sites, a number of drivers that underpin the success of this approach have been identified. Organisations seeking to apply this approach in any industry to drive decisions on asset selection should ensure alignment to these key success factors amongst local and group level stakeholders:

1. Secure early commitment from key senior stakeholders to this rigorous approach to ensure that there is a commitment to objectivity
2. Understand the organisational appetite for capital investment, particularly where essential infrastructure (e.g. power generation) is absent. Factor this into the functional requirement early to eliminate unrealistic candidates.
3. Commence the selection process early to ensure adequate time for any iterations
4. Document all assumptions and agreed upon rules for the evaluation
5. Ensure participation from a wide variety of affected stakeholders including operators, maintainers and management. At a minimum, this would typically include teams from Operations, Planning, Procurement and Asset Management
6. Engage suitable comparable sites early to seek expert

input during the process and design a collaborative participation process with avenue for inputs from all participants. This is especially critical in situations where there is limited real world data about the asset.

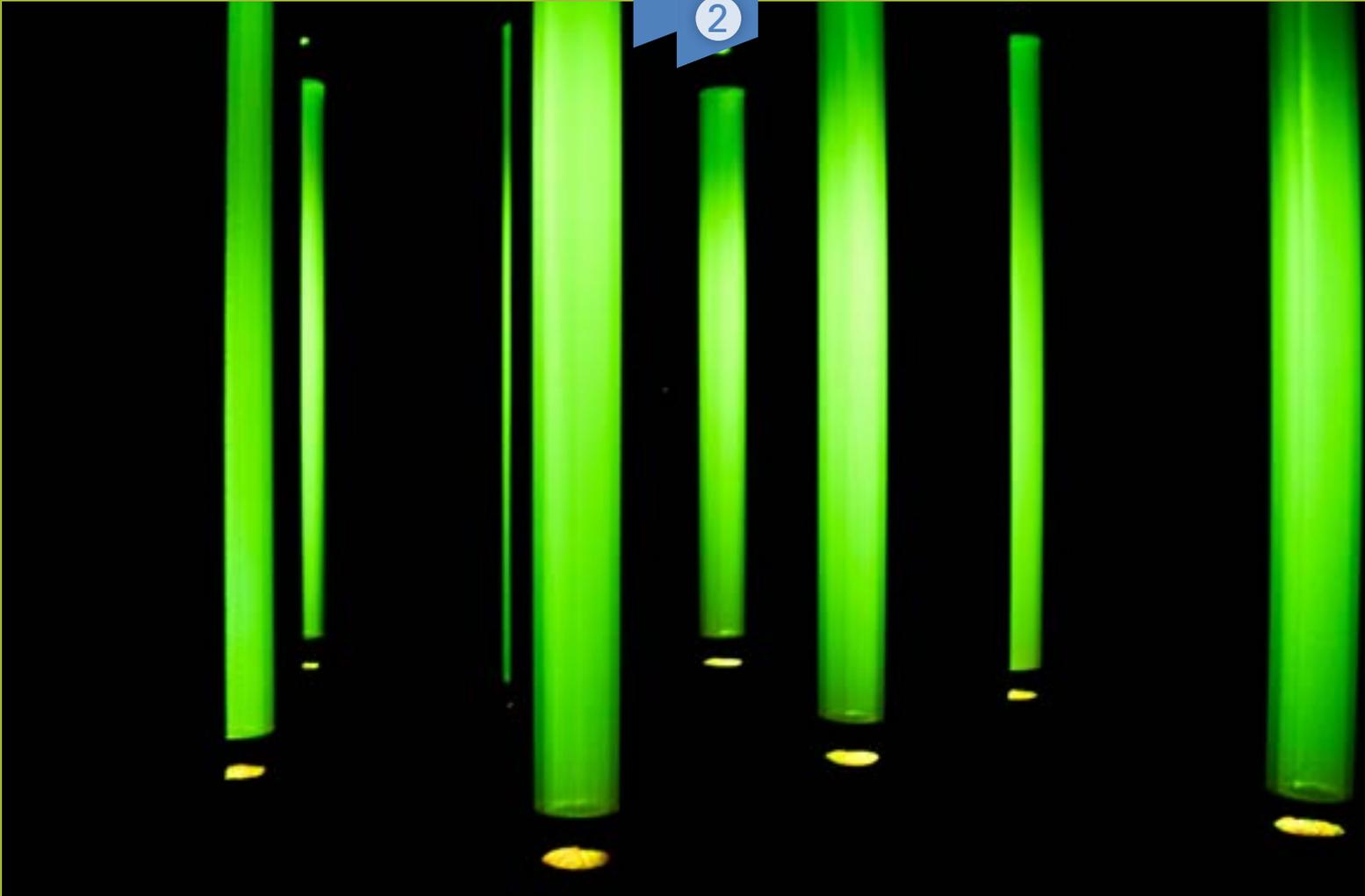
7. When developing the transition plan, consider impacts on all internal and external stakeholder groups, including unions and the local community. In addition, understand the organisation's capability in navigating asset changes when determining the complexity of transition.

## CONCLUSION

With an increasing emphasis on decarbonisation across all industries, organisations are increasingly facing pressure to develop and implement an asset selection process that results in reduced environmental impact without compromising on operational performance. Objective and collaborative methods such as those outlined here will be integral to the procurement teams of large asset operators to ensure that they are acquiring assets that deliver economic and environmental benefits.

## REFERENCES

- <sup>1</sup> Azadi, M., Northey, S.A., Ali, S.H. et al. Transparency on greenhouse gas emissions from mining to enable climate change mitigation. Nat. Geosci
- <sup>2</sup> X Zheng, R Wang, R Wood, C Wang, EG Hertwich et al. High sensitivity of metal footprint to national GDP in part explained by capital formation



# ARTICLE 2 – The role of embodied energy in lifecycle modelling towards a zero emissions future

Darren Chuang, UNSW

## ABSTRACT

Asset management lifecycle delivery and modelling has conventionally focused on – acquire, operate, maintain, dispose (The Institute of Asset Management, 2015) – where the process is measured on economics (lifecycle cost)

without equal consideration for environmental, social, and governance (ESG) factors.

Current practices are unsustainable, as demonstrated by the increasing global average temperature from human caused carbon emissions.

“Built facilities consume over

40% of global energy annually resulting in over 33% of world’s total carbon emissions” (M. Dixit et al., 2014).

The consumption of resources is dependent upon a facility manager’s maintenance and replacement planning and scheduling (A. Brown et al., 2001).

Asset management decisions made accounting for environmental sustainability would have a significant impact on global emissions.

A holistic approach to lifecycle accounts for all costs from cradle to grave. It is critical that lifecycle modelling factors for initial embodied energy, recurrent embodied energy and operational energy when making decisions. Answering the question:

Are light weight, energy efficient, less durable construction materials more sustainable in the long run versus heavy weight, energy intensive, durable materials?

Blending embodied energy data to existing lifecycle cost models, we will share how to incorporate sustainability to improve lifecycle modelling towards a zero emissions future in the built environment.

**Keywords:** Lifecycle, ESG, sustainability, reduce carbon emissions, embodied energy

## INTRODUCTION

Never before in human history have we been richer, more advanced or powerful. Never before in human history have we seen more than 12.6 million hectares of Australian land lost to bushfires in 2019 (J. Werner, S. Lyons, 2020) and in 2022 Brisbane “pounded by a record 790 millimetres of rain in the week up to 28 February. In comparison, London records 690 millimetres in an average year” (A. Klein, 2022).

We can manipulate the environment we live in to make life easier, safer and more comfortable and yet

we feel overwhelmed in the face of rapid climate change. The greatest challenge is the race against time towards net zero carbon by 2050. How do we best invest our time to effectively to make an outsized impact?

“Built facilities consume over 40% of global energy annually resulting in over 33% of world’s total carbon emissions” (M. Dixit et al., 2014) . As the consumption of resources is dependent upon a facility manager’s maintenance and replacement planning and scheduling (A. Brown et al., 2001). Asset management decisions made accounting for environmental sustainability would have a significant impact on global emissions.

A holistic approach to lifecycle accounts for all costs from cradle to grave. It is critical that lifecycle modelling factors for initial embodied energy, recurrent embodied energy and operational energy when making decisions. Blending embodied energy data to existing lifecycle cost models, we will share how to incorporate sustainability to improve lifecycle modelling towards a zero emissions future in the built environment.

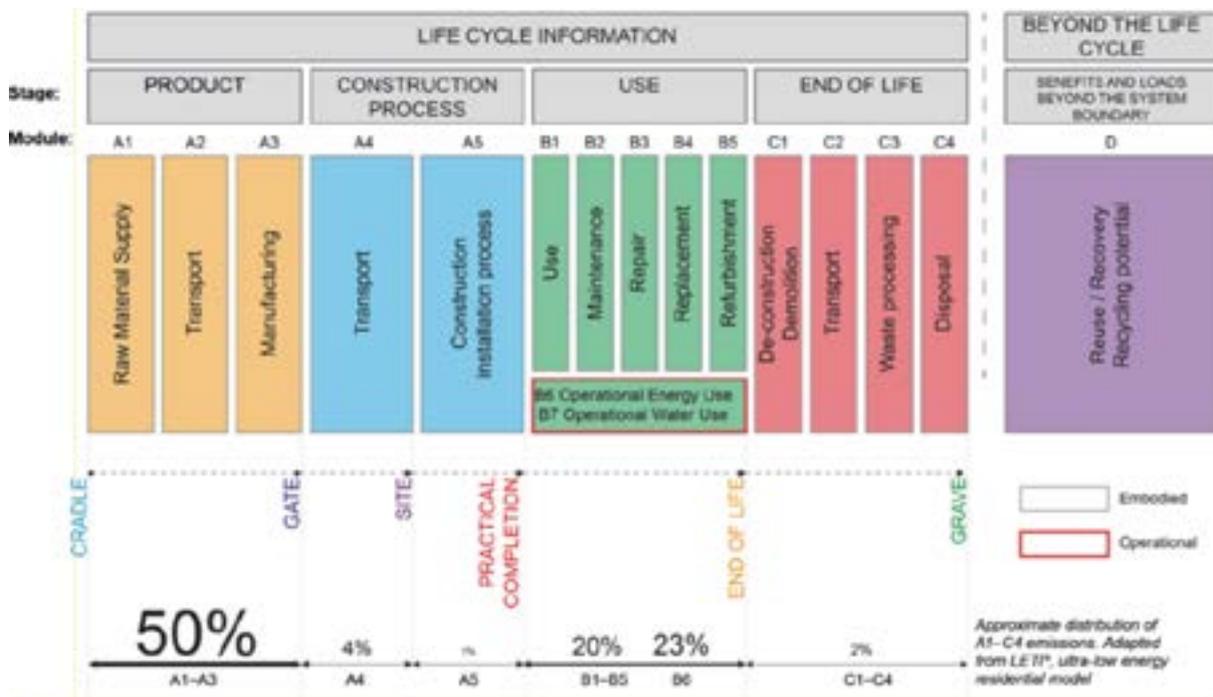
## METHODOLOGY

BS EN 15978:2011 focuses on the calculation method to assess the environmental performance of buildings. The standard breaks down the lifecycle assessment into four stages – product, construction, use and end of life – when measuring cradle to grave asset energy consumption.

**Figure 1** – Potential impact of embodied energy reduction in the built environment (CO2e refers to carbon dioxide equivalent emissions)



**Figure 2** – BS EN 15978 Lifecycle stages



- Product accounts for 50% of total emissions from harvesting the raw material, processing, manufacturing and the transportation in-between these steps.
- Construction accounts for 5% of total emissions from transporting the product to site and energy use in installation
- Use accounts for 43% of total emissions from maintenance, repair, replacement to energy consumption in electricity and water
- End of Life accounts for 2% of total emissions from the removal, transport and waste disposal

AssetFuture as part of the initial stages of research and development, has focused on the first stage – product, cradle to gate – and the associated Embodied Carbon Factor (ECF), measured in kilogram(s) of carbon dioxide equivalent (kgCO<sub>2</sub>e)

$$\text{Embodied Carbon Factor (kg CO}_2\text{e)} = \text{Quantity}_{\text{Material}} \times \text{Carbon Factor}_{\text{Material}}$$

**Equation 1** – Embodied carbon factor (ECF) calculation

Embodied energy data by material (C. Jones, 2019) is blended as an additional variable in the resources of existing lifecycle models. How resources are incorporated in AssetFuture degradation models is shown visually in Figure 3.

The Wall; Face Brick model consists of two tasks, repair and replacement, where both tasks involve materials, trade, labour and consumables. Cradle to gate embodied energy has been added as an additional material cost typically under-represented in the financial cost of materials.

The embodied energy cost (social cost of carbon) is indexed at the current rate of ~\$70 AUD per tonne of CO<sub>2</sub><sup>1</sup> (G. Giller, 2021) and does not factor anticipated future increases by the Intergovernmental Panel on Climate Change (IPCC) to \$135 to \$5000 USD by 2030, and \$245 to \$13,000 USD by 2050 (H. de Coninck, A. Revi et al, 2019) This is amortised over the lifespan of the material to account for durability.

To test the cost impact of embodied energy, a double modular demountable sized building at 163.2m<sup>2</sup> (24m length x 6.8m width x 2.7m height) was simulated using five common wall cladding materials:

- Aluminium
- Concrete
- Face Brick
- Steel
- Weatherboard

## RESULTS

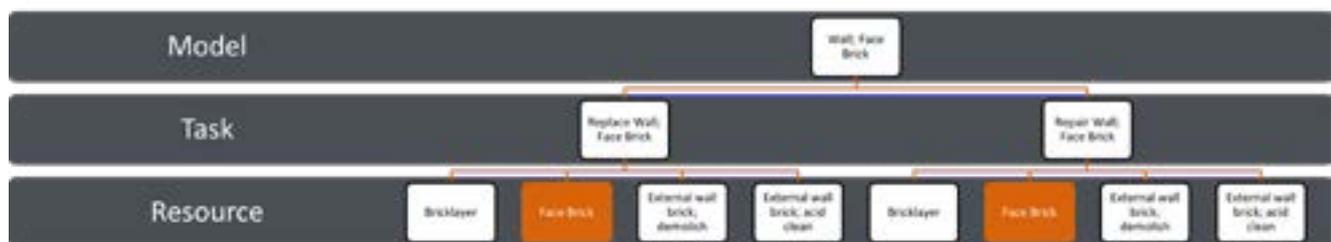
Conventionally, the upkeep cost of a built asset involves maintenance, repair and replacement tasks. Figure 4 shows the cumulative cost of ownership assuming it was built today and projected 120 years into the future. Items are assumed to adopt a preventative maintenance strategy and exist in an Australian temperate climate zone.

Over the projected timeframe, weatherboard has the highest and aluminium the lowest cumulative cost respectively. Aluminium, concrete, face brick and steel intersect with one another over the timeframe depending on its lifespan and when costs (replacements) occur. Weatherboard, with relatively lower lifespan and average to high unit cost, incurs ~50% more cost over time than other cladding materials.

Adding embodied energy cost to the modelling shows that concrete becomes significantly more cost intensive. Despite concrete having one of the longest design lives (100 years), the ECF for pre-cast concrete panels is 2.31x higher than the other four materials combined equating to \$2,450 a year in embodied energy cost. In comparison, the other materials remain relatively consistent to Figure 4, where embodied energy cost was not accounted for.

To put this into perspective, concrete manufacturing industry causes 8% of total global CO<sub>2</sub> emissions (R. M. Andrews, 2017) which would equate to high embodied energy costs.

**Figure 3** – AssetFuture degradation model cross section –Wall; Face Brick



<sup>1</sup>expressed in Australian Dollars at time of writing converted from \$51 US Dollars per tonne CO<sub>2</sub>

Is the simple solution to stop using concrete? Not necessarily. Concrete is a cost effective and efficient way for growing populations in developing countries to build affordable, durable housing. All alternative materials are a distant second choice in providing equivalent characteristics.

## CONCLUSION

Implementing embodied energy cost at a material level demonstrated a 4.41x increase cumulative cost for concrete. When presented with choice, facilities managers should be aware of the embodied energy cost. Materials should be used efficiently to ensure that buildings constructed, operated, refurbished or disposed are safe, durable and sustainable.

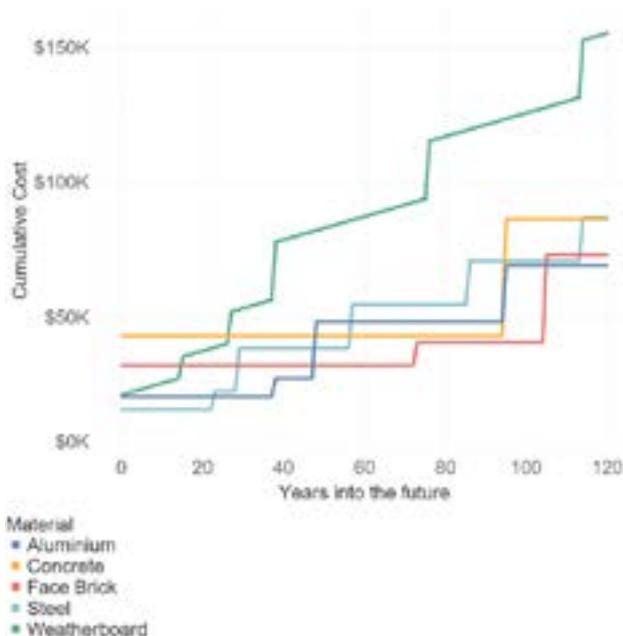
One can easily get bogged down in the complexity of factors to consider and not to consider and lose sight of the bigger picture – achieving net zero carbon by 2050. Embodied energy is only one piece of the built environment sustainability puzzle.

## WHAT'S NEXT?

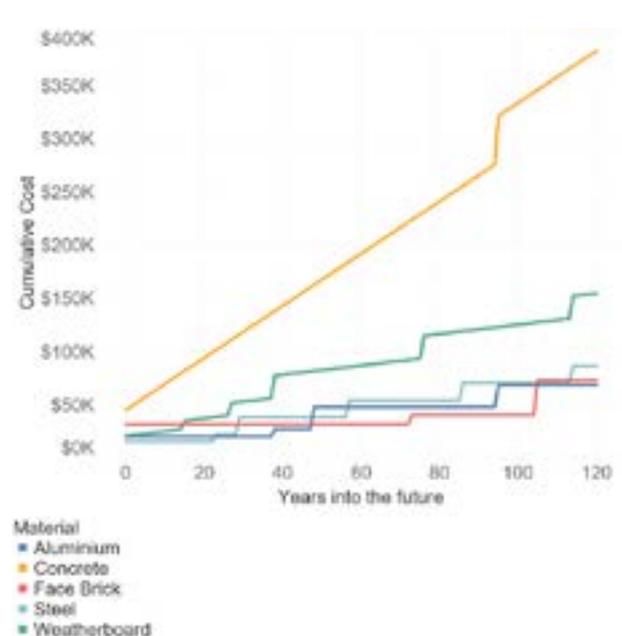
An outcome of the modelling shows that aluminium and steel appear cost effective and sustainable, however, initial embodied energy does not account for thermal transfer. As these cladding materials are relatively thin, the energy consumption costs to regulate the temperature would be significantly higher than the other, more dense materials.

AssetFuture's initial research covers only 50% of the total emissions in the lifecycle. The remaining 3 stages – Construction, Use and End of Life – are currently being explored to determine what are the critical sustainability factors that should be incorporated in a lifecycle cost model.

**Figure 4** – Cumulative cost of wall cladding materials without embodied energy cost

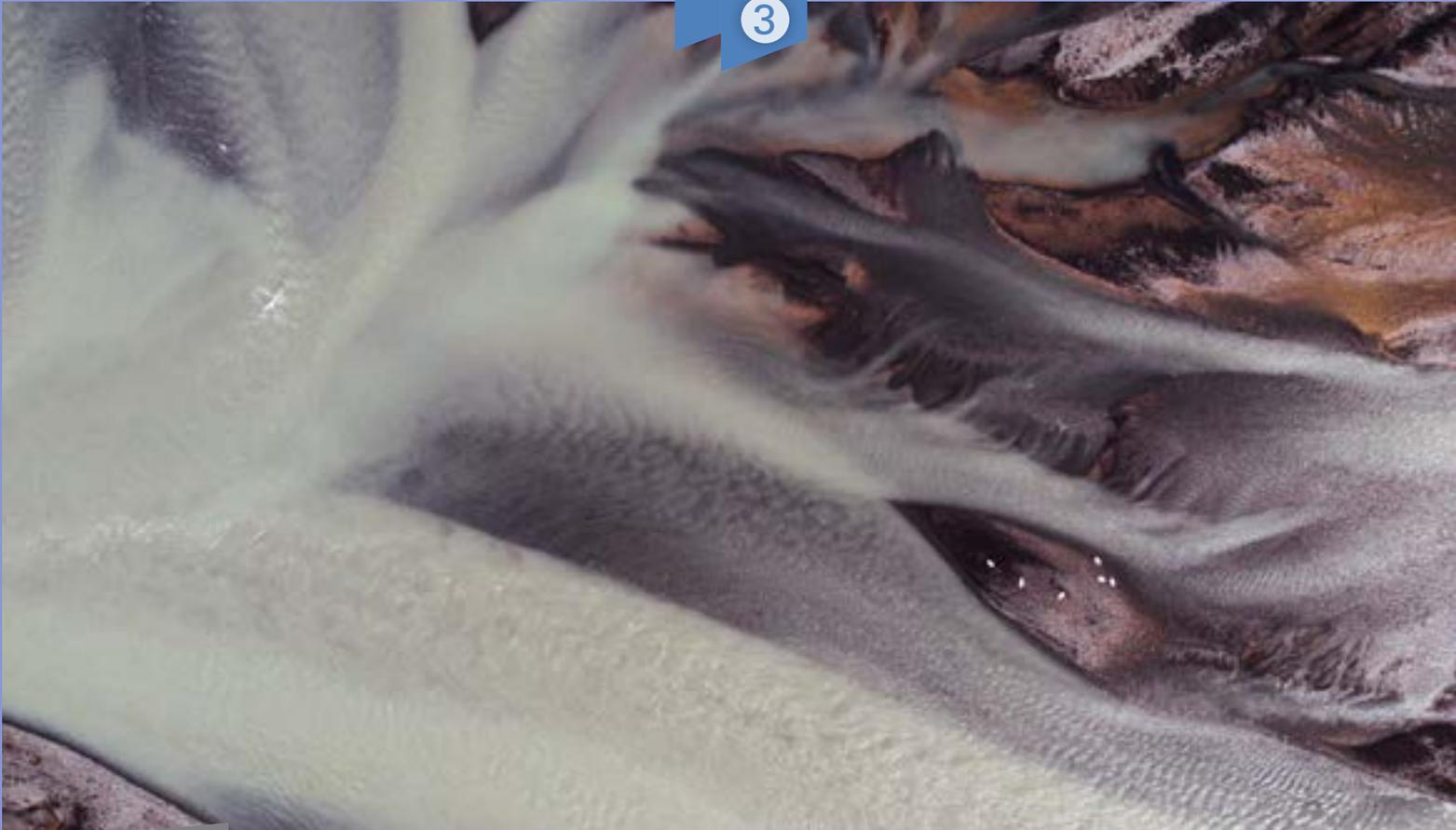


**Figure 5** – Cumulative cost of wall cladding materials with embodied energy cost



## REFERENCES

- The Institute of Asset Management, 2015, *Asset Management – an anatomy*, 2015. [Online] Available at: [https://theiam.org/media/1781/iam\\_anatomy\\_ver3\\_web.pdf](https://theiam.org/media/1781/iam_anatomy_ver3_web.pdf)
- M Dixit et al., 2014, *A facility management approach to reducing energy and carbon footprint of built facilities*. [Online] Available at: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1061.6314&rep=rep1&type=pdf>
- A Brown et al., 2001, *Measuring the facilities management influence in delivering sustainable airport development and expansion*. [Online] Available at: <https://www.emerald.com/insight/content/doi/10.1108/02632770110387814/full/html>
- J Werner, S Lyons, 2020, *The size of Australia's bushfire crisis captured in five big numbers*. [Online] Available at: <https://www.abc.net.au/news/science/2020-03-05/bushfire-crisis-five-big-numbers/12007716>
- A Klein, 2022, *Record flooding in Australia driven by La Nina and climate change*. [Online] Available at: <https://www.newscientist.com/article/2309783-record-flooding-in-australia-driven-by-la-nina-and-climate-change/>
- C Jones, 2019, *The Inventory of Carbon and Energy (ICE) database*. [Online] Available at: <https://circularecology.com/embodied-carbon-footprint-database.html>
- G. Giller, 2021, *The Social Cost of Carbon is Still the Best Way to Evaluate Climate Policy*. [Online] Available at: <https://environment.yale.edu/news/article/social-cost-of-carbon-still-best-way-to-evaluate-climate-policy>
- H. de Coninck, A. Revi et al, 2019, *Strengthening and Implementing the Global Response*. [Online] Available at: [https://www.ipcc.ch/site/assets/uploads/2018/11/sr15\\_chapter4.pdf](https://www.ipcc.ch/site/assets/uploads/2018/11/sr15_chapter4.pdf)
- R. M. Andrews, 2017, *Global CO2 emissions from cement production*. [Online] Available at: <https://essd.copernicus.org/articles/10/195/2018/essd-10-195-2018.pdf>



# ARTICLE 3 – Successful Asset Management Actions to Assess and Increase Resilience to Climate Change

Michael Bilney, Cardno, now Stantec

-   
tsunami
-   
earthquake
-   
flooding
-   
extreme wind
-   
landslide
-   
extreme heat
-   
water stress

It has become increasingly apparent to asset managers and organization leadership that climate and other natural hazard disruptions have caused asset managers to rethink how facilities and infrastructure assets and supply chains should be managed. As a result, asset managers have recognized the need to integrate risk-based resilience and adaptation improvement approaches

into facility operations and supply chain management and decision-making.

This recognition has come through their direct experience with the effects of severe heat and drought, wildfires and floods, and tornados and hurricanes on domestic and international missions in Europe, the US, Australia, Asia/Pacific,

New Zealand, and elsewhere around the globe. These acute, fast-onset climate and other natural hazards have been exacerbated by the debilitating effects of chronic, slow-onset climate hazards such as increasing sea level rise and heat and water stress.

Together, these events have resulted

in a greater focus on managing assets for resilience, during and after recovery, along with actions and metrics to improve management policy and practices. These efforts have been largely designed to decrease the negative effects of disruption to missions, operations, supply chains, and service delivery.

There are numerous examples from government and the private sector that provide lessons learned and offer practical guidance for asset managers to analyze and improve organization, facility, and operational resilience to climate change effects.

The Australian Defence Department assessed certain components of its operations that included development of an Estate Asset Management framework using ISO 55001 as a model. A gap analysis was conducted to identify missing and less than effective asset management practices, and the needed recommendations for improvements in asset management and operations practices.

The Estate Framework project included a brief assessment of climate change-related severe weather impacts on certain operations at two bases. The assessment evaluated certain severe weather risks and resilience management and improvement capabilities and recommended means to improve climate resilience at two of the Defence bases.

The US National Oceanic and Atmospheric Administration (NOAA) conducted an assessment to identify its "Top 10" facilities most at risk to disruption from climate change-related severe weather events. NOAA used a risk-based assessment approach to identify the risk levels at owned and leased facilities.

After determining their top facilities most at risk NOAA conducted onsite assessments at select facilities. For the on-site assessment process, an Analytical Framework was developed to provide a structured analysis and enhance the ability to communicate

the assessment process and results to SMEs and facility management.

A transparent risk-based prioritization method was developed to evaluate risk and to easily communicate the process and results to upper management as well as a standardized enterprise-wide assessment process. The on-site assessment observations identified severe weather related single points of failure and site-specific adaptation and resilience plans and projects with rough order of magnitude cost estimates.

**Lessons learned included:**

- Facility management and Subject Matter Experts (SMEs) should be engaged before the site visit and with daily progress updates at the beginning of each day.
- It is important for the facility to engage with the local community, region, and state to identify and engage in resilience and severe weather response and recovery planning.
- Assessors must engage facility maintenance and other SMEs in development of the site-specific adaptation and resilience improvement plans.
- Recommended adaptation and resilience improvement projects should include rough order of magnitude cost estimates.
- Preliminary recommendations should be reviewed with facility SMEs and leadership prior to submittal in final form with a recommended sequence of priority and execution.

The US National Aeronautics and Space Administration (NASA) used resilience risk analysis techniques to analyze the

resilience of its Environmental Management Division (EMD) and its policies and programs by benchmarking several US and international organizations that had experienced severe (25% or more) budget reductions with their programs. The analysis included benchmarking: the European Space Agency (ESA), US Air Force Space Command (AFSPC), US Army IMCOM-Europe, US AFCEC, USAF Europe, and commercial entities, e.g., HP.

The analysis helped NASA learn from the others' experience with similar significant budget cuts and the resulting impact to their divisions, departments, programs, management systems and stakeholders.

Other findings and recommendations developed from the exercise included actions NASA could take to reduce program headcount and costs and increase resilience of environmental operations across the Agency. These actions included consolidation of environmental program service delivery processes and activities. The management structure of the environmental management division and its programs were evaluated and options for optimization were developed.

Key benchmarking activities included identifying actions taken by the benchmarked organizations to standardize, regionalize, and consolidate program functions, such as Remediation and Contracting. Results of the evaluation helped the NASA EMD determine where potential cost savings and mission support resilience improvements in program function, organization

and staffing were achievable and could be bolstered across the Agency. Benchmarking included how participants organized and structured environmental management in relation to their mission for the following:

- Business objectives
- Operating requirements,
- Infrastructure and assets
- Services needed to protect against and manage environmental and other threats and vulnerabilities,
- Means to reduce risk, and increase business and mission-support resilience

Another evaluation of asset risk from climate change-related severe weather events within the US Department of Defence was conducted by the US Army as a major effort to identify, understand, evaluate, and recommend actions necessary and sufficient to manage the risks from current and predicted increasingly severe pluvial and coastal flooding and other climate change-related risks at two Army bases located in separate, distant US coastal locations.

Both locations had been previously affected by local severe flooding which had inundated and disrupted multiple transportation mission-critical assets including rail, roads, and associated stormwater management structures. The project had four main technical components:

- Flood hazard analysis
- Flood mitigation planning
- Evaluation of and recommendations for other

climate change vulnerabilities

- Recommended preferred mitigation actions appropriate for development of draft documentation for implementation

Results of the flood hazards analysis were used as a resource for master planning efforts and environmental impact study analysis at both locations. The project supported ongoing planning for emerging DOD and Army guidance regarding climate change, vulnerability assessment, and resilience. Project results included:

- Identification of potential flood risks in mission critical-asset management areas
- Key sources of mission-critical asset and mission risk
- Mitigation measures to improve disruption response and readiness
- Actionable mitigation measures to communicate resilience needs in response to climate change and related flood hazard influences

A current asset management initiative by a US civilian agency involves a project to further develop the climate security and resilience programs, action plans and management practices. The purpose of the project is to help the agency provide support to their overseas facilities to improve their resilience to climate change-related severe weather and other natural hazards.

The initial project tasks included development of a risk assessment and prioritization method to prioritize approximately 300

facilities and identify those most at risk to climate change effects in nearly 200 countries which encompass over 25,000 properties. The scope of work included identifying the posts at the highest risk to climate change-related severe weather and other natural hazard disruptions and the acceptable levels of risk to the agency.

The second major task in the first task order focused on evaluating the capital projects and major acquisition projects process, working with master planners to identify opportunities to develop early-

stage guidance on natural hazards and integrate climate security considerations into the agency's major acquisition, due diligence, and early design processes. This task also included analysis of management system elements and policy and procedures to develop recommendations to integrate climate change security and resilience considerations into other organization management systems, policies, and procedures.

The third major task activities focused on the development of an internal communication plan to facilitate outreach to stakeholders. The intent of the communication plan is to equip the climate security and resilience program with a compilation of interconnected Power Point slides describing the natural hazards and level of risk to agency facilities. The communication plan was designed and to be segmented and customized for a range of topics and audiences. The complete set of slides outlines the evolution of the climate and natural hazard program and highlights program goals, activities, accomplishments,

and the benefits of integrating climate and resilience planning within related organizational policies, practices, procedures, and activities across the organization.

The task order was recently modified to include on-site assessments of site-specific natural hazard risks to identify effective adaptation and resilience improvements and investment cost-benefit ratios. The facilities will be selected for on-site evaluation based on the level of risk which is characterized by the variability of the hazard exposure, severity of impacts to people, mission and cost, and the type and level of vulnerabilities. Lessons learned from the on-site evaluations will be used as a model for improvements in the initial task order outputs, methods, and processes and to further reduce the risk from climate and other natural hazard events.

Key takeaways from these and other projects include (additional details will be provided during the presentation):

- Lessons learned from vulnerability, and resilience analysis, e.g., the need for site-specific and regional vulnerability indicators.
- Effective risk-based approaches to analyze and prioritize climate and other natural hazard risk and resilience, (specific examples will be provided during the presentation).
- Why asset managers must engage in local and regional resilience planning for preparedness, response, and recovery, for example the competition for energy, water, and wastewater.
- Why asset managers must understand “resource competition” in supply chains and possible cooperation with competitors.
- Key elements of resilience risk analysis and recovery.

All projects unveiled mission- critical problems which must lead to identifying effective solutions, as the following:

- Jealous protection of policy development, alignment and integration hinders effective collaboration
  - **Solution: policies requiring collaboration/cooperation with specific performance metrics**

- Conflicts in planning efforts across organizational silos and departmental lines, i.e., security and Asset Management, suboptimizes results
  - **Solution: make case for saving of time and \$\$ with aligned, integrated cooperative/collaborative planning and exercises/testing**
- Poorly defined/vague authority, responsibility and accountability results in ineffective planning, response, and recovery
  - **Solution: policy requirements driving greater definition, specification, alignment and integration for optimal protection, response, continuity, and recovery**
- Disconnects in management and response/ recovery processes/practices result in suboptimal protection, continuity, and recovery
  - **Solution: process analysis, definition, formalization, and testing/exercises**
- Loss of institutional knowledge results in vulnerability and loss of continuity
  - **Solution: culture of on-going knowledge management and capturing of Lessons Learned during disruptions and exercises**
- Lack of accurate asset inventory and condition data prevents decision-makers from making fact- based decisions on levels of service and recovery time objectives
  - **Solution: collect accurate, up-to-date, actionable asset condition data and integrate with business continuity planning and business impact analysis**
- Lack of accurate asset inventory and condition data prevents decision-makers from making fact- based decisions on levels of service and recovery time objectives
  - **Solution: collect accurate, up-to-date, actionable asset condition data and integrate with business continuity planning and business impact analysis**
- Being “too busy” to develop and exercise sound Business Continuity, Asset Management and

Resilience Improvement plans means “failing to plan”

- **Solution: develop a culture of recognizing effective Business Continuity, Asset Management and Resilience Improvement as a “part of what we do”!**

The projects generated some Key Recommendations:

- Begin by using publicly available climate change data and carefully evaluate the cost of non- public data
- Participate in regional, state, county, and community climate change and emergency planning efforts and initiatives
- Analyze and understand potential country, region, local resource competition issues!
- Use results of facility climate risk/resilience analysis to inform planning: SAMPs, COOPs, BCPs, Resilience Improvement Plans
- Specify key decision points and adaptation/ resilience actions in internal and external stakeholder planning
- Systematically evaluate resilience in ongoing, iterative facility planning exercises using FCA and structural data
- Note: The method does not replace the decision-maker, it only informs the decision-making process!

In summation, due to the increasingly severe climate-related weather-caused disruptions, asset managers are quickly learning to incorporate climate and other natural hazard risk considerations into their planning and operating process.

This along with the obvious need to collaborate internally across business and departmental and supply chain lines and externally across competitor, community, state, regional and international borders.

Asset managers are ever more frequently learning that the “new normal” helps them become better and more effective operations and risk managers.



## ARTICLE 4 – Sustainable Asset Management

Customising bridge inspections to better manage maintenance and capital spend in a resource dependent environment

Dr Susan Rebaño-Edwards

### ABSTRACT

Monitoring the condition of assets through a regular inspection regime is an essential activity of the asset lifecycle. Condition inspections are key to informing decision making in asset maintenance and capital expenditure and ensuring that appropriate maintenance, renewal or rehabilitation and replacement of the assets are undertaken in a

timely manner.

Asset condition assessments can be costly for organisations that are largely funded from rates and subsidies for their operations and dependent on external service providers for expert technical advice. These organisations are often constrained by their limited resources to regularly monitor condition of their assets. When such an essential activity

in the asset lifecycle cannot be achieved, organisations are more likely to make short term decisions on asset maintenance and capital investments that are unsustainable over the long term.

A more practical approach to condition monitoring is needed when assessments are costly, there are limited funds as well as a large number of assets to manage. Such an approach will

need to be structured around the organisation's capacity to deliver – taking into account its funding base and staff capability to ensure 100% achievability by the organisation.

This paper details the practical approach developed for a small NZ road controlling authority, Tairāwhiti Roads, to optimise investment decisions in the management of its bridge assets.

**Keywords:** bridge inspections, asset condition inspections, bridge inspection policy

## INTRODUCTION

Gisborne District Council is a New Zealand unitary territorial authority, governing the area constituted as both the Gisborne District and the Gisborne Region. The region includes the City of Gisborne in north eastern part of the New Zealand's North Island, the largest settlement in the Gisborne District (or Gisborne Region).

From 2015-2019, Council's land transport and parking activity was managed by Tairāwhiti Roads, a business unit under joint venture arrangements with the NZ Transport Agency. Tairāwhiti Roads was responsible for managing the District's 1,882 kilometres of local road network which included 429 bridges.

Tairāwhiti Roads had a purely reactive maintenance policy for managing the District's bridge assets. Since bridge maintenance budget forecasts were informed by historical expenditure trends and not by asset condition, funding was often limited to routine or minor maintenance work such as

cleaning, clearing debris, signage renewal/replacement, re-painting, replacing broken or damaged rails, patching or minor deck repairs. If the bridge required major structural maintenance work or component replacements and costs exceeded the budget, a temporary fix was applied often in combination with load restrictions or partial bridge closures. Due to insufficient or lack of funds, all structural maintenance work was often deferred to the next annual budget round or in the next 3-year budget cycle. The bridge restrictions imposed, if any, remained in place, until remedial work was completed.

Compounding this problem was:

1. the reliance on external resources i.e professional services consultants or expert technical advisers, to carry out condition inspections and provide professional advice on any structural or remediation work and/or design. Approximately one third of the budget was consumed yearly for professional services (including condition inspections) with the remaining two-thirds utilised for routine or minor maintenance. The budget was so tight that bridge inspections often had to be deferred;
2. the inspections were also recorded on a paper-based form with bridge and component details for inspection and provision for Inspector recommendations. The form did not require condition rating and risk assessment rankings of each component. So, in order to

carry out any remediation work on the bridges, a bridge engineer/consultant had to be engaged to further interpret, analyse, prioritise and provide advice on appropriate action;

3. the inspection reports were also uploaded into the road asset management information system in \*.pdf format which made tracking of defects/faults on bridges difficult. Further work had to be carried out to organise the inspection data of 429 bridges sequentially in a spreadsheet so it could be easily manipulated to develop a bridges program of works;
4. the absence of a formal asset inspection policy and asset condition inspections monitoring regime meant inspections were non-compulsory so they were carried out only when funds permitted. A reactive approach to maintenance was the usual practice so only bridges that were contentious or the subject of community complaints, bridges with reported faults or damage were prioritised for structural maintenance; and,
5. with an infrequent inspection regime, the condition state of the majority of the bridge stock could not be regularly monitored.

## A CASE FOR CHANGE

For a very long time, most of the bridge maintenance budget was spent on professional services fees for expert technical advice and condition inspections. Inspection results were also not fully utilised to inform the

maintenance and management of the District’s bridge assets. Remedial work on bridges could also not proceed due to lack of funds. In a 3 year (2015-2018) period, only 0.2% of some 70 bridges that required structural maintenance was attended to. By 2016-18 financial years, the bridge maintenance backlog was estimated at NZ\$5.5 million; and, by 2019-21, the backlog in bridge maintenance and renewals was NZ\$12.3 million and NZ\$8.2 million respectively, with the maintenance backlog increasing at a rate of 67% per annum within a 3 year period due to the ageing bridge stock. (Figure 1).

It was apparent that the process for managing the District’s bridge stock was unsustainable. It was also clear that, to maintain the serviceability of the bridge assets, there was a need to increase investment in bridge maintenance, renewals and component replacement; and, for the investment to be informed by lifecycle needs of the assets as inferred from condition inspections.

Gisborne District Council’s annual road asset valuation report (2019), showed that bridges were the third highest value roading asset with a total replacement cost of NZ\$127.6 million. The cost to maintain the serviceability of all the District’s bridge assets was one third (NZ\$42.4 million) of the costs to replace all these assets. There were obvious savings to be gained from investing in the long-term maintenance of bridges. The increased investment would extend the life expectancy of the bridge thus avoiding the higher costs for replacement.

To ensure that the maximum benefit could be gained from an increased investment, improvements had to be made to bridge asset management practices:

1. Introduce a structured 3 tiered approach to condition inspections so internal and external resources could be utilised more efficiently to minimise costs;
2. Re-design inspection forms to ensure that information collected was explicit and could be promptly utilised to inform the long-term planning process without the need for additional interpretation and analysis by technical experts, hence, avoid additional professional services costs;
3. Dispense with paper-based inspection forms and utilise available technology to manage inspection data more effectively and efficiently; and,
4. Implement a formalised best practice asset condition inspection and monitoring regime supported by a bridge inspections policy to ensure consistency and compliance.

In July 2016, a best practice bridge inspection policy and procedures manual was prepared with the technical assistance of a bridge engineer from OPUS International Consultants (now WSP New Zealand), that provided for compulsory recording of condition data on each bridge element in Pocket RAMM . An electronic bridge assessment sheet with the bridge component or element sets i.e. main, durability, safety, ancillary and other elements, was developed in the Pocket RAMM environment for the Inspector to use and record details on the faults/defects on each bridge element set, upload photos and enter other details such as remedial work, costs, risk assessment and priority of the remedial work. All this information was then extracted from the RAMM database, exported into an Excel spreadsheet so the data could be manipulated to develop a forward works program.

The 3 tier approach to inspections also ensured that work could be categorised and appropriately funded as either maintenance, renewal, replacements or capital upgrade. The 3 tier approach was based on the AustRoads Standard for bridge inspections. The inspection forms for each tier was developed in consultation with the bridge engineer/consultant to ensure compliance with NZ codes and standards and expanded to include additional and more explicit information.

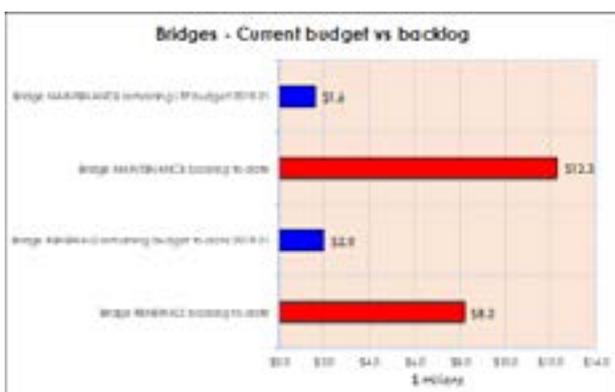


Figure 1

**Level 1 - Routine Maintenance Inspections.** The minimum qualification for Level 1 Inspector was a Works Supervisor experienced in the construction and maintenance of bridges; or a Bridge Inspector with practical relevant experience and competent to judge the condition of bridges.

Level 1 Inspectors have to provide details of the required maintenance and remedial work, upload photos of the fault or defect, record the extent and severity of the fault or defect using a condition code provided, recommend routine maintenance, regular monitoring or Level 2 Bridge Condition Inspections (if deemed appropriate from structural observations). They would also have to include cost estimates of the remedial work recommended, prioritise each work as High (work to be carried out immediately); Medium (work to be carried out within the next 3 years); or Low (work to be carried out within the next 5 years). All this information would have to be entered into the Pocket RAMM inspection form via a mobile device or tablet.

The minimum frequency of Level 1 inspections was a three (3) yearly cycle. Inspections were prioritised as follows:

**Group 1: Year 1 of the inspection cycle** – all bridge types on regular logging routes with 50-100% usage and those located in areas with a history of high vulnerability of flood, fire, accident and earthquake damage.

**Group 2: Year 2 of inspection cycle** – bridges with ≤ 50% logging trucks usage and 25 to 50% used by vehicles with ≤ 1 tonne gross mass.

**Group 3: Year 3 of the inspection cycle** – all other bridges on roads that are not logging routes.

The 3 yearly inspection frequency was aligned with Council's 3 yearly budgeting cycle, so budget forecasts and bridge forward works program could be developed in time for input into the long term planning processes.

When the capacity or integrity of a bridge or set of bridges was severely compromised by a disaster or significant emergency event – e.g tsunami, significant flooding, bushfire, earthquake, or accidental damage events, a **Level 1 Emergency Inspection** would be initiated. Such an inspection had to be completed and faults recorded within 24 hours of the event, in Pocket RAMM.

**Level 2 – Bridge Condition Inspections.** The minimum qualification for Level 2 Inspectors was either a Bridge Inspection Engineer with a minimum 5 year experience in the supervision of bridge construction, inspection and maintenance and able to interpret condition in terms of structural action; or, an accredited Bridge Inspector who completed an NZ Transport Agency endorsed bridge inspection training course.

A Level 2 inspection would be instigated only on the recommendation of the Level 1 Inspector. A Level 2 inspection involved a more detailed element condition assessment and a structure condition assessment. A Level 2 inspection would be carried out for bridges with possible structural defects/issues as identified in the Level 1 inspection. It would involve, for example, drilling for timber bridges and investigation and testing of the principal bridge elements (including measurement of cracks, presence/extent of active scour, etc.); reporting the extent (%) of the condition of the principal bridge elements using a Condition State Rating system provided; determining the aggregate rating of the structure as a whole using a Structure Condition State Rating system provided; and, identifying and programming preventative maintenance requirements. Inspectors also had to assess risk using the qualitative risk matrix provided.

Level 2 inspection results were used to inform the annual structural maintenance or component replacement program of works.

**Level 3 - Detailed Structural Engineering Inspections.** The minimum qualification for a Level 3 Inspector was a Professional Engineer with corporate membership of the Institution of Professional Engineers New Zealand, or recognised equivalent, with extensive and current bridge design and construction experience (minimum of 5 years).

Level 3 inspections are detailed engineering investigations and assessments of individual structures and conducted only when required. This inspection would include physical testing and/or structural analysis, to assess current structural condition, behaviour and capacity, rate of deterioration and residual life expectancy and asset management strategies. Level 3 investigations are intended to provide improved knowledge of the condition, load carrying capacity, in-service performance and other characteristics that are

beyond the scope of a Level 2 Inspection.

These inspections were used to inform the design of capital bridge upgrades such as structural safety improvements and bridge load capacity. There are two sub-categories: Levels 3A Structural Safety Inspection and 3B Load Capacity Assessment.

While Levels 1 and 2 inspections data had to be entered into an electronic assessment sheet in Pocket RAMM, Level 3 inspections, due to the extent of detail required, were presented in the form of written reports (Word or pdf format) summarising the findings of the inspection, the results of the testing/analysis with conclusions and recommendations for action. To inform the capital works program, both Level 3(a) and Level 3(b) Inspections had to include up to three (3) options with cost estimates for bridge remedial or strengthening work.

## CONCLUSION

Inspection services were procured by public tender in 2017 and the successful tenderer was awarded a 3 year renewable contract. The Level 1 inspections data that were collected for the 2018-2021 financial years resulted in two “packages” of maintenance and renewal work:

**Package 1.** Were routine or minor maintenance and or renewal work items specified in the current road maintenance contract. These were routine work that Tairāwhiti Roads’ maintenance contractor was responsible for delivering under the road maintenance contract:

- Removing detritus from decks, drainage systems, deck joints, etc.
- Repairing damaged barriers and handrails
- Maintaining drainage systems and deck surfacing
- Keeping deck joint, bearings, linkages clear of detritus and obstructions
- Removing graffiti
- Maintaining signs, markers and lighting
- Completing annual torque testing of gantry foundation bolts and flange joints

**Package 2.** Were structural maintenance or renewal work items that required structural engineering solutions, hence, these work items required the professional services of a bridge or structural engineer. These were prioritised based on urgency and/or safety risk by the Level 2 inspector.

For package 2, all related services to deliver the structural repair or remedial work for each bridge such as professional services to investigate, design, prepare the required documentation i.e. resource consent application and tender documentation etc; and, physical works delivery were quantified and a maintenance or renewal budget estimated by the bridge inspector. These works were advertised via public tender and carried out by the successful physical works tenderer.

The 2015 Bridges Inspection Policy and Implementation Manual was amended and updated in 2019 to include retaining wall inspections. This initiative has also paved the way for all other roading assets to be inspected in the same way to inform the annual forward works program. Assessment forms for footpath, retaining walls and road drainage assets have since been developed in pocket RAMM and used for all asset condition inspections.

## REFERENCES

Gisborne District Council – Land transport, 2019. *Bridges and Retaining Walls Inspection Procedures Manual.*

# STAR PROFILE – John Kirwan CAAM

## 1. Why Asset Management?

Throughout my Civil Engineering career, I have been involved with assets in one way or another. Way back when I was a Technician (undergraduate), I supervised inspections of manholes, outfalls, pump stations, and network CCTV surveys for the water industry. In this instance, it was important to capture structural condition, capability, impact to environment, and characteristics (invert levels etc) to not only update the asset register, GIS and network models with current information but to also inform of network efficiency as well as frequency of maintenance activities or renewals based on the risk assessments conducted. I have therefore seen firsthand and appreciate the importance of why we need to manage our assets. Particularly, to ensure they deliver what they are designed for, within expected costs, for the design life, and with minimal risk, especially to the public or users. I guess it was natural progression for me to move from being on the front line, carrying out the inspections, to having oversight of the broader picture.

## 2. What is your speciality?

I am currently involved in the asset performance reporting of transport assets across NSW. This includes reporting on metrics such as: routine planned maintenance, annual works program, asset failures, defects, asset reliability and availability. I have recently broadened my skills to Asset Assurance which will include the coordination of audits on transport related assets for routine, investigative or regulatory purposes.

## 3. What is the most exciting trend that you've noticed in asset management today?

Continual improvements in the technology space, for example machine learning and AI to ascertain appropriate maintenance scheduling based on sufficient historical data (e.g. previous inspections). Also, the increasing move towards cloud systems that capture asset data such as inspection history, characteristics, asset class and type which is updated live and allows reports to be generated



from one source of truth. This improves efficiency and accuracy of data collection for things like performance reporting by removing superfluous processes. Drone technology is also advancing and can provide an alternative solution when undertaking visual inspections of assets especially when accessibility is an issue or a cost driver.

## 4. What is your proudest career achievement?

I would have to say completing my Civil Engineering PhD in 2021, which I worked on part-time, over several years while working full-time. The research was based on thin cold-mix road surfacing with the addition of glass fibres to reduce crack propagation. From an AM perspective, the study identified the surfacing as being a highly favourable road refurbishment solution for local authorities. Such that, at the operate/maintain and dispose stage, it provided substantial savings in terms of lifecycle costing and greatly reduced emissions from a net zero carbon standpoint when compared to conventional surfacing.

## 5. What's next for you?

As this is a particularly new career direction for me, I shall be continually improving and upskilling in the AM space as well as expanding my knowledge from working alongside more experienced asset

managers. I also plan to progress my registration to the next step, CPAM, once I reach the required competency level.

**6. When you're not busy at work, what do you enjoy doing to unwind/relax/explore?**

I enjoy spending time with my wife and daughter, whether it be going on bush walks, watching movies, having a kick about with the footy in the park, or losing at boardgames - sometimes deliberately to let my daughter win.

*John recently achieved his Certified Associate of Asset Management (CAAM). To find out more about our internationally recognised certification scheme, visit [www.amcouncil.com.au/certification](http://www.amcouncil.com.au/certification)*

**POWER** *Your Asset Management*  
**CAREER** *to New Heights*

**BECOME CERTIFIED**

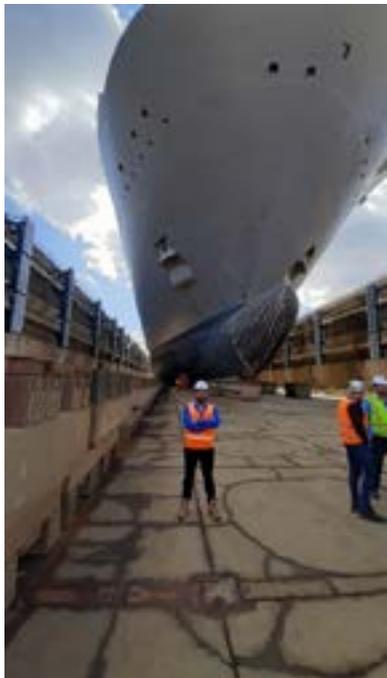
Distinguish Yourself from your peers:

- Demonstrate your knowledge
- Gain proof of your skills to apply systems to improve performance
- National and internationally recognized qualification
- Illustrate commitment to continuous professional development

CFAM  
CSAM  
CPAM  
CAAM

Learn more at: [www.amcouncil.com.au/certification](http://www.amcouncil.com.au/certification)

# STAR PROFILE – Truong Vu Nguyen CPAM



*I am the LSA Program Manager at Babcock International base in Fleet Base East, Garden Island Defence Precinct. My mission is deliver world class Asset Management Solutions on behalf of the Royal Australian Navy for His Majesty Australian Ship (HMAS) Canberra and Adelaide.*

*This has been a very challenging and rewarding position which I have been honoured and humbled to be a part of it.*

## 1. Why Asset Management?

It's the brains behinds every business.ber.

## 2. How long have you been working in the asset management sector?

10 Years come November.

## 3. What is your speciality?

Defence maritime sustainment.

## 4. What drew you to explore more about this particular speciality?

It is a very complex and challenging working environment. However, the friendships you make will be for a life time.

## 5. What's the best career advice you've ever received and who gave it to you?

One thing a day, plus 10%. Simon Jeffery my current boss he is the Asset Performance and Optimisation Manager.

## 6. What makes a great asset manager?

Humility, kindness & Curiosity. Humility is essential when you are facing complex technical and business challengers this allows you to "put yourself in their shoes" and learn rapidly. Kindness is one of the "Babcock" key traits. I try every day to be kind in both words and deeds both in my professional and personal life. Curiosity, is the combination of the 2 because it helps you grow and develop your skills sets in asset management.

## 7. What is the most exciting trend that you've noticed in asset management today?

RCM and BI producing dynamic dashboards to really help to tell a story.

## 8. What is the biggest challenge facing up-and-coming asset managers today?

The demand for high quality asset managers with experience to acquire, sustain and dispose assets to protect Australia and allow it to proper in the region.

## 9. What advice would you give to an up-and-coming asset manager today?

Learn and be positive in all your challengers.

## 10. What is your proudest career achievement?

Delivering a series of in depth system reviews in collaboration with the RAN, KPMG, OEM's and RA's (Repair Agents).

## 11. What's next for you?

Expand my knowledge of RAN vessels to further enhance my ability to delivery future asset management solutions.

## 12. When you're not busy at work, what do you enjoying doing to unwind/relax/explore?

I enjoy reading biographies, singing with the Holy Cross Schola, shucking oysters from Bateman's Bay and occasionally I go sailing.

*Truong recently achieved their Certified Practitioner of Asset Management (CPAM). To find out more about our internationally recognised certification scheme, visit [www.amcouncil.com.au/certification](http://www.amcouncil.com.au/certification)*

# STAR PROFILE – Daniel Kelleher CSAM

## 1. How long have you been working in the asset management sector?

This very much depends on one's perspective of, what actually is asset management? In my way of thinking, I've been in this space since starting my apprenticeship as a fitter and turner back in 1994, and since then, I've continued to study, continued to learn, and continued to broaden my horizon in terms of my thinking. For example, I've gone from being a maintenance fitter fixing widgets, to being a mechanical engineer and building assemblies of widgets, to then manager of thousands of widgets and ensuring they are adequately maintained, and then to managing the long-term budget for those widgets to ensure they get replaced in line with the life-of-mine.

## 2. What is your speciality?

I've sort of had about three distinct phases of my career, and everyone I've ever worked with would have a different opinion or view of what I specialise in. For example, anyone I worked with in my 5-and-a-half years at Mount Isa Mines, would say I have a clear specialisation in fixed-plant reliability engineering and small capital projects. You know the type of things: running shutdowns and crews of trades and engineering personnel; cyclone upgrades; upgrading old worm-drive geared drives to modern equivalents; replacing or building new access platforms; replacing overhead travelling cranes; condition monitoring of ball mills and other fixed plant, and jumping in when required to fix breakdowns. Real dirty hands-on maintenance engineering and reliability engineering, where my team and I were accountable for identifying the problem via downtime analysis or con-mon, exploring options and concepts, budgeting for capital for the projects, through to planning, scheduling and physically executing the solution, but then also wearing the success (or lack thereof) of the project. Full autonomy, and full accountability. Since moving to Rio Tinto in 2015, I was thrust into heavy mobile equipment reliability engineering. Draglines, rope shovels, large fleets of electric drive



haul trucks. By now I was a professional engineer, but this was literally like starting an apprenticeship again! Within a year or so, people began to think I specialised in HME. The fact was, because I was unfamiliar with HME, I had to start applying asset management principles (that I'd almost subconsciously learnt over 20 years) and apply them to these assets. I was no longer the technical expert, but rather, I had technical experts working for me. So I had to implement sound technical decision-making processes and technical principles, such as, for example a dragline shutdown, first you need shutdown drivers, then you need a scope, a budget, resourcing, planning, scheduling, executing, and then post-shut review. This is identical to running a shutdown in a concentrator. So now, in 2022, what do I specialise in? It's hard to put this into words, but I could confidently walk into any operation (mine, smelter, concentrator, factory), and from a base of nothing, implement an asset management organisation and system from scratch and from first principles.

## 3. What's the best career advice you've ever received and who gave it to you?

Always try and make yourself redundant, by mentoring and coaching your direct reports into

doing your job – actively seek opportunities to make this happen. This builds your succession plan, and ultimately, it is far easier to get promoted if you have people who can step-up into your role and to cover for you.

#### **4. What makes a great asset manager?**

In my firm opinion, and from what I've learnt in the roles I've been in with full autonomy to roles that are fully networked, is that the single biggest indicator of success in asset management is the level to which all individuals involved perceive that they have ownership of the physical assets. If you can get the individual maintenance fitter, the machine operator, the reliability engineer, the long term planner, or in fact any individual role in AM, and get them coming to work each day with the firm belief that they own the assets, then you will have a successful AM organisation and thus you will be a successful asset manager. It's psychology, and it's leadership, and I cannot overstate the importance of this concept.

#### **5. What is the biggest challenge facing up-and-coming asset managers today?**

From my viewpoint, the biggest challenge faced by asset managers, is that everyone thinks they are qualified to make, exercise, or overrule asset management decisions. It's very common, for example, for an operations manager or a general manager to overrule a shutdown schedule, or a capital budget, or a maintenance org design, or to try and decide how many haul trucks are required or when a crane needs to be replaced. I've had to spend nearly three decades to work this out, along with an engineering degree and masters degree, to be able to make these decisions, yet seemingly anyone can decide that we are not going to follow a lifecycle cost model or a rebuild schedule. We don't see this in other professions, for example, nobody ever questions the validity of the decisions made by the geologists in their drilling and core sampling program, or decisions that mining engineers make in long term mine plans. In my time, the best approach I've seen to rectify this disparity was from Ian Cribb, COO of Glencore Coal (who incidentally started his career as an apprentice fitter & turner)

who in his org structure had an Engineering Director. Ian would quite pointedly say 'Engineers make engineering decisions', which gave the Engineering & Maintenance managers to the authority (and blessing) to implement their asset management decisions.

#### **6. What is your proudest career achievement?**

I have three; one based on role, one based on technical, and one based on people.

- 1) In 2020/2021, I had the opportunity to be the acting General Manager at Weipa Operations for 8 months. I think I did a reasonable job, and for the first time ever, I was working in a non-asset management role. For example, for the first time I had to address the community, our traditional owners, host ministerial visits, deliver state-of-the-nation addresses to our 1,400 employees, and in general deal with non-AM related crises (Covid, lockdowns, etc.). And, I enjoyed every second of it!
- 2) From a technical viewpoint, and for many reasons beyond the scope of this interview, was in 2015/16 when I built from scratch a 'least negative NPV lifecycle cost model' to determine which of several engine options would 'cost the least' over the lives of our fleet of Komatsu 830E haul trucks in our coal mines. I now know this as an NPC model, but at the time, I built it from scratch (in Excel) based purely on what I had learnt during my master's degree I'd completed the previous year. My model was scrutinised by many, and was subsequently endorsed by the business and was the primary tender evaluation tool upon which a consensus decision was reached to purchase 170 high-horsepower engines across RTCA and RTIO. And probably, for the first time ever, I got to work on a project that was purely related to asset management, as distinct from maintenance, and put into practice my uni studies.
- 3) Executing a triple-succession plan in a single afternoon. I received a promotion at the Mount

Isa Lead Smelter, which significantly increased my remit. I'd spent the previous few years assembling a high-performing team at the No.2 Concentrator with complementary skillsets to one-another – that team could do anything and had no limits. The afternoon, I was at home after work when I received my promotion, and my manager and I then cruised around Mount Isa to find people and hand out the domino of subsequent promotional contracts: my Senior Mechanical Engineer was promoted to Engineering and Reliability Superintendent; my design engineer was promoted to Senior Mechanical Engineer; and one of my most talented drafties promoted to Senior Design Draftsperson. In fact, now that I think about it, my manager that day executed a quadruple succession plan! I doubt I'll ever again get the satisfaction of executing a succession plan such as this, that took me four years to develop.

## **7. What's next for you?**

My primary goal at the moment is to do a good job of being the Site Senior Executive at Weipa Operations, and to discharge my obligations under the Qld mining and quarrying act and regulation. Fortunately, I have a great team who are constantly stepping up into my substantive role of Asset Manger for Rio Tinto Aluminium Pacific Operations. However, once I can get back into my role, my sights are firmly set at integrating asset management across Pacific Operations, which in addition to our bauxite mines at Weipa and Gove, includes our refineries and smelters at Gladstone, Bell Bay, and New Zealand.

*Dan recently achieved his Certified Senior Practitioner of Asset Management (CSAM). To find out more about our internationally recognised certification scheme, visit [www.amcouncil.com.au/certification](http://www.amcouncil.com.au/certification)*



ASSET MANAGEMENT COUNCIL

# ASSET MANAGEMENT FUNDAMENTALS COURSE

Run online in a live interactive session over two consecutive mornings offers a thorough overview of asset management. The purpose of the Asset Management Fundamentals program is to understand the fundamentals of asset management and how they can provide benefits to the organisation. Please click here to register.

Course learning objectives:

- Define asset management within the context of ISO 5500x suite, the Asset Management Landscape and AMBoK
- Identify the principles that underpin asset management
- Identify available asset management tools and techniques that are applicable within organisational context
- Identify opportunities to apply these learnings to improve individual and organisational performance.

**January 20 & 21**

**February 13 & 14**

**March 16 & 17**

**April 20 & 21**

**May 15 & 16**

**June 15 & 16**

Register at [www.amcouncil.com.au](http://www.amcouncil.com.au)



# AMPEAK23 is a world leading asset management conference and features a range of exhibits, case studies and technical content from all industries

**AMPEAK23 - enabling leaders in asset management to achieve excellence in the management of assets**

AMPEAK23 is the meeting place for asset managers and a place to engage in lively discussion on emerging topics of interest in asset management, share new ideas and knowledge, and find practical solutions to take and use in your workplace.

Come and hear from asset management experts covering lifecycle issues for all assets, take part in interactive sessions, chat to exhibitors and networks with professionals across all sectors and industries.

Eight distinct topics that will be of interest to academia, directors, CEO's, executive managers across asset rich organisations, asset management and maintenance practitioners, including:

- **Excellence in Asset Management:** Understanding your stakeholders; Challenges for AM leaders; Share your organisations Asset Management Journey
  - **Value and Benefits of Asset Management:** Value creation; Asset performance and asset health monitoring; Outcomes realisation; Meeting the ESG imperative; Driving social equity through AM to meet SDG's; Explaining AM to the Board and C-suite
  - **Asset Management Planning:** Maintenance strategies; Capital investment decision making; Maintenance and operations decision making; Contingency planning; Risk assessment and management
  - **Asset Lifecycle Delivery:** Asset creation; Tailoring Systems engineering; Maintenance delivery; Maintenance, reliability, criticality of aged assets; Reliability engineering asset operations; Fault and incident response; Asset decommissioning and disposal; Procurement and supply chain management; Shutdown and outage management; Resource management
  - **Asset Information and the Digital World:** Cyber security; Next generation AM information systems; Advances in digital engineering; Move to smart assets; Impact of connected environments; Using digital to drive AM decision making; Asset Information strategy, Systems, Standards; Data and information management; BIM and Digital twin challenges for AM; AI role in AM
  - **Asset Management People and Leadership:** Asset management leadership; Sharing beliefs, values and assumptions; Change management challenges; Embedding AM processes and practices; Collaborating to address the Skills crisis; Empowering the future generation; Building an asset management competency framework ; Resourcing a resilient workforce
  - **Governance for Asset Management:** Building, Implementing, Maintaining and Monitoring an effective Asset Management System; Building the right objectives;
- Asset management policy; Strategic planning; Management review and audit, compliance and assurance; Technical standards and legislation; Integrated Management Systems into enterprise management system; Aligning with ISO55001:2014
- **Future proofing Asset Management:** Integrating climate risk assessments in to AM; Building resilience into asset management systems; Frameworks for resilient asset decision making; Re-imaging finance mechanisms for resilience; AM and circular economy; Nature based solutions; Transitioning to net zero; Decarbonisation technologies and associated stranded assets; Asset management in a Covid world; Use of technology in AM

## SYDNEY LOCATION

This year's conference is being held in Sydney with welcome reception at the fabulous Madame Tussauds.

You won't want to miss our Gala Awards night. The 2023 dinner and awards ceremony will be held in the magnificent Ballroom at Doltone House, Hyde Park.

## NOMINATE YOUR ORGANISATION FOR AN AWARD

Nominations for asset management excellence are available in a range of categories. Awards will be presented at the gala dinner.

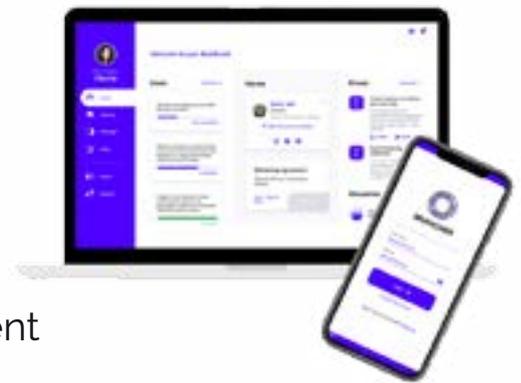
[WWW.AMPEAK.COM.AU](http://WWW.AMPEAK.COM.AU)

# Asset Management Mentoring Program

Sign up as a MENTEE today

## Why join?

- ✓ Career development
- ✓ Collaboration
- ✓ Knowledge sharing and skill development
- ✓ Resilience and wellbeing
- ✓ Networking



You'll be supported with bite-sized online training and only need to commit 1 - 2 hours per month, for a duration that suits you.



For further information and to sign up, visit [www.amcouncil.com.au/mentoring](http://www.amcouncil.com.au/mentoring)

Get Recognised!

# AMCOUNCIL EXCELLENCE AWARDS

Get your nomination in now!

The Asset Management Council Awards celebrate the significant contribution individuals and organisations are making to the advancement of asset management in Australia, and internationally.

The Awards recognise organisations who are making a start and are on the journey of continuous asset management improvement.

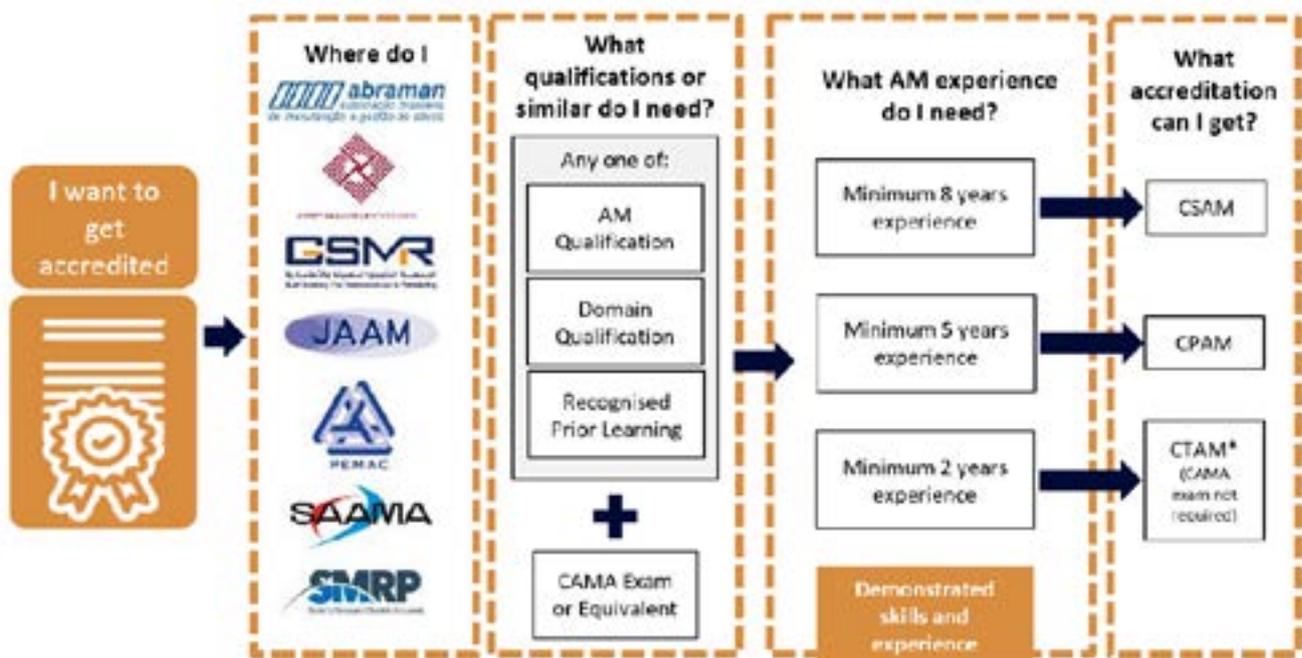
The Awards also recognise individual achievement in asset management leadership and student innovation in the field of asset management.

**NOMINATIONS CLOSE FRIDAY 3rd MARCH 2022**

For further info, visit: [www.amcouncil.com.au](http://www.amcouncil.com.au)



## Global Certification Scheme Application Requirements



\* CTAM "AM Certificate" requirements under development

13 OCTOBER

# INTERNATIONAL DAY FOR DISASTER RISK REDUCTION



## International cooperation for developing countries to reduce their disaster risk and disaster losses

#DRRDay #OnlyTogether



### INTERNATIONAL DAY FOR DISASTER RISK REDUCTION - RESILIENCE PLANNING

International Day for Disaster Risk Reduction was in October. #DRRDay is a chance to recognise progress made in addressing vulnerability to disasters, whether natural, man-made, local, or national. Disaster risk reduction is about reducing exposure to disasters and mitigating the threats that they pose, through the practice of good asset management.

COVID-19 pressured us all to re-evaluate our pandemic resilience plans. As we recover from the implications of the pandemic It's the perfect time to develop emergency planning and response measures. So, ask yourself:

- Does your organisation's asset management system integrate and implement actions to address disaster risks?
- Have you recently evaluated the effectiveness of your resilience mitigation actions?
- Are there new risks to consider?
- Have you considered how these risks can change with time?

#ISO55000 can help your organisation recognise the importance of coordinating relevant disaster risk reduction measures. It offers guidance on developing contingency and resilience plans as part of an AM framework, and also facilitates the implementation of emergency preparedness, response and recovery,

and long-term development plans. A list of relevant ISO standards can be found via the following link:

<https://www.iso.org/committee/5259148/x/catalogue/p/1/u/0/w/0/d/0>

For more guidance on how your organisation can develop a strategy of resilience and integrate contingency planning into its asset management system, take a look at the [Sendai Framework for Disaster Risk Reduction](#). To foster better understanding and knowledge of the causes of disaster risks, [The international strategy for disaster reduction](#) will help reduce the probabilities of undesired effects as well as build and strengthen coping capacities.

# CHAPTER NEWS

## BRISBANE

Brisbane members enjoyed a field trip to Cross River Rail (CRR) to get an understand of work that's being carried out at CRR and to talk about the ability of digital engineering initiatives to create efficiencies and embed data-driven decision making within the asset management lifecycle.

The event was run as a mix of panel discussions with Andrew Curthoys and his team from Cross River Rail Delivery Authority (CCRDA) where they talked about the CRR project, in-scope AM activities, digital engineering initiatives being undertaken, their impact on efficiencies in delivering CRR infrastructure and witnessed a Drone Fly-Through of CRR infrastructure by CRR pilots at the 360o Reality Theatre. Before the session, delegates took the opportunity to try out virtual-reality headsets with a tour of CRR infrastructure across Brisbane.

Brisbane Chapter member, William Hanneman, has recently taken on the role of the Asset Management Council's YAMP (Young Asset Management Professionals) Chair. We wish to welcome Will and look forward to supporting his interest of growing and developing young asset management professionals within the chapters.

Brisbane Chapter member, Tanya Viano, has recently stepped into the role of Chair for the Asset Management Council's Maintenance and Reliability in Asset Management (MRiAM) special interest group (SIG) and is working hard behind the scenes with her committee to put together a fine program of maintenance inspired events for 2023.

## MELBOURNE

Melbourne members congregated for a lunchtime session in late September to take a look at two perspectives of finance and asset management. Firstly to cover asset depreciation for accounting and tax purposes and how to manage the differences that inevitably arise. As part of this, guest speaker Rosie Foldvari considered how sharing of data between finance teams and asset management teams can ensure more accurate depreciation policies, based on true asset lives, and help finance teams manage

the level of granularity required by the Australian Capital Allowances Legislation. This was followed by a presentation on the non-financial value of asset valuations by Julian Watts who spoke about the value that can come from well executed asset valuations, how this drives the improvement in data quality and the non-financial benefits that are able to be realised in terms of people, process, data and technology.



In October, Melbourne members took part in an evening session for a lively discussion on managing climate change and sustainability within the AMAF framework. WSP executive directors, Rami Affan and Jamie Maslen, provided an overview of the approach that the Department of Treasury and Finance are taking to address this important aspect of asset life cycle management considerations.



## NEW ZEALAND

November saw the New Zealand Chapter host a hybrid session on standardisation and maturity assessment for asset information with attendees participating both in person at the WSP Wellington office (thanks, WSP!) and online from all parts of Australia and NZ. The session was broken into two parts.

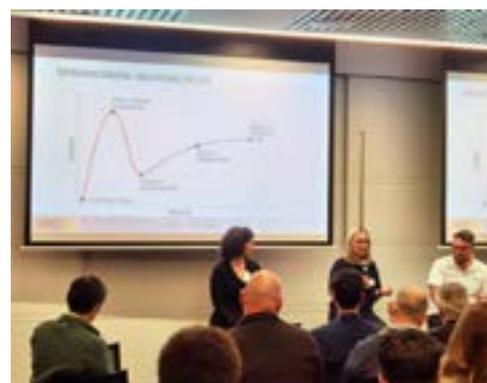


The first, David Darwin, lead investment planning advisor for Waka Kotahi NZ Transport Agency, covering the purpose of their asset management data standard, how it is being developed and implemented, its scope, and the role it has both in a traditional environment and as an enabler of digital engineering. The second, Jules Congalton, director and principal of Asset Dynamics on their experience of applying an asset information maturity model to identify organisational strengths and opportunities for improvement in asset information governance, quality assurance and information systems.



## PERTH

Perth asset management enthusiasts were treated with an excellent session on applying digital asset management to get the most from our physical and information assets. First up was Matt Cheney from Western Power on digital technology enabling a customer centric asset management approach, followed by Helen Forte from Water Corporation on experiences with digital asset management journey in the water industry, wrapped up by Dr Yvonne Power from IMPower Technology on deploying digital technology to manage asset risk-cost-performance remotely. The event was very well attended by a diverse audience across multiple sectors. Audience participation was amazing and panel session lively.



# CHAPTER NEWS

## SYDNEY

It was that time of year again for the Asset Management Council's government symposium. Thank you to all who came, supported and participated in the AMCouncil's government asset management symposium on Friday. Chaired by Rami Affan of the Asset Management Council's Government in Asset Management special interest group, it was a great opportunity to network and share with peers within government and across industries, an ideal forum to discuss today's decisions for tomorrow's outcomes.



# TC-251 update (ISO550xx)

Martin Kerr



As the members' representative on the international standard, I wanted to take this opportunity to provide you with an overview and update on what is happening in the standard for Asset Management Systems.

Since being appointed in 2017, I have had the opportunity to contribute across various areas of the standard, with the latest being dual convener for ISO55000 and ISO55001. This has provided me with

insight into how different countries and industries understand, apply, and receive value from an Asset Management System.

## WHAT IS A MANAGEMENT SYSTEM STANDARD?

*"A management system is the way in which an organization manages the interrelated parts of its business in order to achieve its objectives. These objectives can relate to a number of different topics, including product or service quality, operational efficiency, environmental performance, health and safety in the workplace and many more."* (source: [ISO Website](#))

## HISTORY

In 2014 ISO released the first version of ISO55000 and ISO55001. In the lead-up to the release of the standard, it was known as PC251. PC stands for "Project Committee", with 251 representing the number of committees that ISO has registered since its beginning. TC stands for "Technical Committee", which has been in place since the PC had approval for its draft standard to become an approved standard.

The structure of TC251 is as follows.



TC251 has 35 x Participating Members (P-members), 20 x Observer Members (O-members) and, 34 x Liaison members (L-members)

## NATIONAL STANDARDS BODY - AUSTRALIA (MB-19)

A National Standards Body (NSB) is an approved (P-member) that has voting rights in any decision regarding an internal standard. MB-19 is the name given to the Australian “mirror committee,” which is governed by Standards Australia, and represents the interest of Australia by way of cross-industry representation. The Asset Management Council of Australia is one such entity that is approved to sit on MB-19 that has a vote on the future of the standard. We are fortunate to have 5 members of MB-19 who are also members of Asset Management representing different industries.

## REVIEW OF STANDARDS

In May of 2021, TC251 voted to review the contents of its standards, technical specifications, and guidance documents. The review of standards is required to be undertaken in a 5-year cycle. The review cycle (due in 2020) was delayed (postponed) due to a parallel review of the HL (High-Level Structure) of an ISO Management System Standard (MSS). This has meant that the second revision of ISO55000/01 is scheduled for release in 2024.

An MSS has an approved structure and sections that apply to all MSS (>80 currently). Within each standard, there is content that is referred to as “blue text.” Blue text is locked in, and any request to change it must go via the ISO Technical Management Board. Text that is added to support a particular topic in addition to the blue text is referred to as “black text.” This rule is important as it maintains consistency across the many MSS.

A summary of how a standard goes through a review process is as follows

- NWIP – New item work proposal
- Working Draft (WD)
- Committee Draft (CD) – (note: there may be multiple CDs as there have been in 00 and 01)
- DIS – Draft International Standard
- FDIS – Final Draft International Standard (Final text)
- Publication

(For further information on ISO stages see <https://www.iso.org/stage-codes.html>)

### ISO55000 (Workgroup 4)

ISO55000:2014 provides an overview of asset management and asset management systems. It also provides the context for ISO 55001 and ISO 55002.

During the review cycle, there has been robust discussion on fundamentals (principles), risk, value, decision making and emerging global topics such as six capitals.

A challenge that the 00 standard has is that is considered more open systems thinking, but it also isn't how to asset management, it is why you would do asset management.

ISO55000 has a target publication date of August 2024.

### ISO55001 (Working Group 6)

ISO55001:2014 specifies the requirements for the establishment, implementation, maintenance and improvement of a management system for asset management, referred to as an “asset management system”.

The review cycle commenced in 2021 with the consideration of 6 themes. The themes each had a theme lead, and throughout CD1 and CD2, each topic was challenged. The DIS phase that is about to be undertaken will be done in parallel with 55000.

ISO55001 has a target publication date of August 2024.

### ISO55002 (no current workgroup)

ISO55002:2018 contains explanatory text necessary to clarify the requirements specified in ISO 55001 and provides examples to support implementation. It does not provide guidance for managing specific asset types. It is based on the actual journeys experienced by successful early adopters of ISO 55001 in over thirty countries over the first four years of the 00/01 standard being published. It describes how to implement an asset management system based on the requirements of ISO 55001.

A formal review of ISO55002 is yet to be announced but is likely once the other standards have entered the DIS/FDIS stage.

### **ISO55010 (Workgroup 5)**

ISO/TS 55010:2019 Asset Management — Guidance on alignment of asset management, finance and accounting. This Technical Specification provides guidance on the alignment between the asset management functions, finance and accounting functions within an organization.

While this TS was developed, it had a workgroup made up of country representatives that use accrual accounting and those that didn't. This created a positive challenge in the consideration of the alignment of both financial and non-financial functions.

ISO55010 has a target publication date of December 2023.

### **ISO55011 (Workgroup 7)**

ISO 55011 Guidance for development and application of public policy to enable asset management sets out to provide guidance for establishing and sustaining an enabling environment for asset management through public policy - applicable to national, provincial or local governments or their agencies.

In November 2020, WG7 launched a survey, "ISO 55011 Asset Management and Public Policy," to solicit input from persons believed to be experts in the development, administration, or influence of general public policies at different government levels within their countries. The survey gathered input from 110 participants representing over 20 countries to determine what type of guidance would help promote or enable asset management, especially related to specific public policy instruments or applicable public policy documents.

ISO55011 has a target publication date of September 2024.

### **ISO55012 (Workgroup 8)**

"People involvement and competence" is sought to be an International Standard which provides guidance on engaging people in an organization's asset management system, and on enhancing their involvement and competence within it.

The first working draft of 55012 focussed heavily on

competency, and as the draft moved through the review cycle, leadership took more of a focus.

ISO55012 has a target publication date of August 2024.

### **ISO55013 (WG9)**

ISO 55013 - "Guidance on the management of Data Assets in asset management" is an international guidance standard, which aims to provide guidance to organizations on factors to consider in increasing and sustaining the usefulness of data assets to meet asset management objectives, and by extension, organizational objectives.

ISO55013 has a target publication date of August 2024.

## **SUMMARY**

I am proud to represent the members of our Council, and while there are many late-night meetings, time zone challenges, and language barriers, I continue to gain insight into how the world is adopting asset management and asset management systems.

At our recent exchange weekend, I extended to our chapter chairs a roadshow in 2023 that will hopefully provide further information for our members and the opportunity to ask questions.

Regards

**Martin Kerr (CFAM/CAMA/PPD)**

<https://www.linkedin.com/in/martin-kerr/>

# New Members

|          |             |
|----------|-------------|
| Kerryn   | Wilson      |
| Nicholas | Cook        |
| Raman    | Pelia       |
| David    | Jansen      |
| George   | Salouros    |
| Bhavin   | Shah        |
| Amutha   | Thananjeyan |
| Parikh   | Sharma      |
| Sammy    | Chuang      |
| Ledene   | Ellis       |
| Stephan  | Zacharko    |
| Polyanna | Smith       |
| Prageeth | Gunarathna  |
| Gary     | Nisbet      |
| Puneet   | Nangia      |
| Marc     | Lon Ho Kee  |
| Eddie    | Tsoi        |
| Abhinav  | Pradhan     |
| Craig    | Roberts     |
| Alex     | Leyland     |
| Matthew  | Willard     |
| Jacques  | Commarmond  |
| Fay      | Bushell     |
| Pinaki   | Banerjee    |
| Shane    | Oldham      |
| Reyhaneh | Sahraeian   |
| Stephen  | Lister      |
| Vineta   | Risteski    |
| Seyam    | Habibi      |
| Daniel   | MacPherson  |
| Pari     | Chugh       |
| Charlie  | Rohwer      |
| Mohsin   | Muhammad    |
| Matt     | Otaran      |
| Luke     | Johnson     |
| Wunna    | Tun         |
| Trang    | Le          |
| Declan   | van Greunen |
| Arka     | Ghosh       |
| Evan     | Willemse    |
| Wayne    | DeAraugo    |
| Steve    | Lilliss     |
| Andy     | Ng          |

|           |                  |
|-----------|------------------|
| Alan      | Martin           |
| Chlodaugh | Smith            |
| Tony      | HENDRICKS        |
| Scott     | Kelly            |
| MD Tanjir | Rahman           |
| Jared     | Morkel           |
| Sravanthi | Ravula           |
| Razin     | Mahmud           |
| Alisha    | Salim            |
| Kara      | Hanwright        |
| Aaron     | Tunnicliff       |
| Benjamin  | Kot              |
| Lee       | Rice             |
| Joanne    | Moss             |
| Mal       | Ahmedi           |
| Marco     | Mok              |
| Hanimi    | Bolla            |
| Luke      | Nairn            |
| Aisha     | Alardhi AlNuaimi |
| Afsana    | Khatoon          |
| Lachlan   | Lavery           |
| Michelle  | Barkley          |
| Robiaul   | Khan             |
| Mark      | Parish           |
| Shine     | Salur            |
| Naomi     | Jones            |
| Beverley  | Chin             |
| Matilda   | Manning          |
| Jonathan  | Kaelo            |
| Thilak    | Shankaran        |
| Rahim     | Noruzi           |
| Hamilton  | Pinheiro         |
| Jeffrey   | Anthony          |
| Michelle  | Ng               |
| Kuntal    | Biswas           |
| Kevin     | Aidan            |
| Chris     | Frisby           |
| Natalia   | Goranova         |
| Sean      | Duggan           |
| Jie       | Liu              |
| Rustam    | Asamov           |
| John      | Brookes          |
| Mark      | Blackler         |
| Shoukat   | Raza             |

# New Members

|                    |                 |  |
|--------------------|-----------------|--|
| Ying               | Jiang           |  |
| Nosa               | Osula           |  |
| Quang              | Ly              |  |
| Mary               | Elcheikh        |  |
| Terry              | O'Brien         |  |
| Quality Management | Australia       |  |
| Keith              | Jobson          |  |
| Brian              | ten Brinke      |  |
| Natasha            | Roza-Butler     |  |
| Qasem              | Alhaddad        |  |
| Ravi               | Naidu           |  |
| Colin              | Grainger        |  |
| Chris              | Tilmouth        |  |
| Josh               | Gorringe        |  |
| Tarun              | Sharma          |  |
| Premjith           | Mannakunnath    |  |
| Brent              | Henshaw         |  |
| Zam                | Mbalu           |  |
| Cheryl             | Lees            |  |
| Stuart             | Nield           |  |
| Jacinta            | O'Connor        |  |
| Grahame            | Deacon          |  |
| Nicole             | Walker          |  |
| Tedd               | Irvine          |  |
| Ted                | Davis           |  |
| Esther             | Augustin        |  |
| Denielle           | Cleverly-Ormsby |  |
| Fungayi            | Murape          |  |
| Arthur             | Loubser         |  |
| Peter              | Mcguire         |  |
| Joshua             | Smeets          |  |
| Janis              | Clarke          |  |
| Lunlun             | Xiang           |  |
| Rodney             | Woodruff        |  |
| Deborah            | Price           |  |
| Ezra               | Chen            |  |
| Angela             | Mclean          |  |
| BetterAIM Pty Ltd  |                 |  |
| Manvi              | Gandhi          |  |
| Mehrdad            | Mehrabi         |  |
| Grant              | Harris          |  |
|                    |                 |  |
|                    |                 |  |
|                    |                 |  |

# How Much KNOWLEDGE & EXPERIENCE *Protects Your Assets?*



ARE YOUR EMPLOYEES  
ASSET  
MANAGEMENT  
COUNCIL  
**CERTIFIED?**

*Improve Retention* ■ *Enhance Recruitment* ■ *Increase Portability*

Get the facts: [www.amcouncil.com.au/certification](http://www.amcouncil.com.au/certification)

# Membership Application



ASSET MANAGEMENT COUNCIL

## ASSET MANAGEMENT COUNCIL LTD

A Technical Society of Engineers Australia

ABN: 15 141 532 747 [www.amcouncil.com.au](http://www.amcouncil.com.au)

Phone: +613 9819 2515 Email: [accounts@amcouncil.com.au](mailto:accounts@amcouncil.com.au)

Thank you for joining the Asset Management Council. Please complete all sections. Phone or email with any queries.

### PERSONAL DETAILS (Please print in BLOCK CAPITALS)

Title (Please circle) Dr Mr Mrs Ms Miss Other (Please specify) Sex (Please circle) F M

Family Name Given Names (in full)

Date of Birth Engineers Australia Membership No

### CONTACT DETAILS (Please print in BLOCK CAPITALS)

Preferred Address:  Private Address or  Business Address

Position

Organisation

Postal Address

City State

Country Postcode

Phone Fax

Mobile

E-mail

### AREAS OF INTEREST (Please tick)

#### Technical Topics

- Reliability
- Availability
- Maintainability
- Performance
- Spares Planning
- Maintenance Planning and Scheduling
- Maintenance Plan development and implementation
- Maintenance Policy/Strategy development
- Logistics
- Shutdown planning and the maintenance interface
- Asset Management
- Other:

#### Issues

- Skills development
- Training
- Other:

#### Industries

- Facility Management
- Consulting
- Power
- Transport
- Defence
- Oil and Gas
- Mining and Industry
- Water and Utilities
- Infrastructure
- Other:

Return completed Membership Application with payment to:  
Asset Management Council  
PO Box 2004, Oakleigh Vic 3166

### GROUP AFFILIATION

Young Asset Management Practitioners (18-35 year olds)

### CHAPTER AFFILIATION (Please tick one)

Newcastle       Canberra       Sydney       Illawarra       Mackay  
 Melbourne       Adelaide       Brisbane       Hobart  
 Darwin       Overseas       Gippsland       Perth

### MEMBERSHIP FEES Effective Jan 2015 (Please tick one membership type only)

Individual Annual Fee (including GST)

Member \$154.00

Student \$33.00

Corporate Annual Fee (including GST)

Platinum \$9,570.00

Silver \$1,804.00

Gold \$3,608.00

Bronze \$957.00

GST (10%) does not apply to overseas memberships.

### CORPORATE MEMBER NOMINEES

Platinum – 30 nominees, Gold – 10 nominees, Silver – 10 nominees, Bronze – 5 nominees

| Name | Email | Date of Birth (Mandatory) | AM Council Chapter |
|------|-------|---------------------------|--------------------|
| 1    |       |                           |                    |
| 2    |       |                           |                    |
| 3    |       |                           |                    |
| 4    |       |                           |                    |
| 5    |       |                           |                    |
| 6    |       |                           |                    |
| 7    |       |                           |                    |
| 8    |       |                           |                    |
| 9    |       |                           |                    |
| 10   |       |                           |                    |

Contact Asset Management Council to provide more corporate nominee details.

### PAYMENT

Method of Payment (please tick one and enclose payment)

Cash

Money Order or Cheque drawn in AUD from an Australian bank payable to **Asset Management Council Ltd**

International Money Order

Credit Card  
(Australian or New Zealand Bankcard only acceptable)

Credit Card Details Please charge my card (tick one card type)

Visa

Bankcard

Mastercard

Diners

American Express

Card no

Expiry

Amount \$

Name on card

Signature

Date

# Corporate Partners and Corporate Members

## STRATEGIC PARTNER

Rio Tinto

## PLATINUM

ASC Pty Ltd

Ausgrid

BAE Systems

BGIS

Downer Group

Pacific National

Rio Tinto

Serco AsPac

South32

Sydney Metro

Transdev

Transport for NSW

Ventia Pty Limited

## GOLD

Airservices Australia

Alstom

Aurecon Australia Pty Ltd

Austal Ships Pty Ltd

Boeing Australia

Capability by Design

Copperleaf Technologies

Department of Defence CASG

Department of Families, Fairness and Housing

Department of Fire and Emergency Services (WA)

Department of Health

Department of Transport - Network Planning Group

Energy Queensland Limited

Essential Energy

Evoenergy

GE Digital

GHD Advisory

HATCH Ltd.

Health Infrastructure

Infor Global Solutions (ANZ) Pty Ltd

Infrastructure NSW

Innovyze

Jacobs

KPMG

Naval Ship Management (Australia)

Northrop Grumman Integrated Defence Services Pty Ltd

NSW Telco Authority

Parks Victoria

Port of Newcastle

Power and Water Corporation

Service Stream

Southern Ports

Stanwell Corporation Limited

Sydney Water Corporation

Territory Generation

Thales Australia Limited

TransGrid

Transurban Ltd

V/Line

Warship Asset Management Agreement Alliance

Western Australia Police Force

Western Power

Wood Plc (Australia)

WSP Australia Pty Limited

Xenco Pty Ltd

## SILVER

AECOM Australia

AMCL

Anglo American Metallurgical Coal

Armidale Regional Council

AssetFuture Pty Ltd

Aurizon Network

Australian Rail Track Corporation Ltd (ARTC)

Babcock International Group

City of Gold Coast

Comfort Delgro NSW

Court Services Victoria

Department of Transport

Fire and Rescue NSW

GHD NZ

Greater Western Water

ISS Facility Services

Jemena

John Holland Group Pty Ltd

Kellogg Brown and Root Pty Ltd (KBR)

KiwiRail

Lycopodium Infrastructure Pty Ltd

Melbourne & Olympic Parks

Minset

New Zealand Defence Force (Defence Equipment Management Organisation)

Norship

Northern Territory Government Dept. of Infrastructure, Planning & Logistics

Nova Systems

Origin Energy

Programmed Facility Management

Public Transport Authority

PwC Australia

RES Australia

Sodexo Australia Pty

Stantec Australia Pty Ltd

Sutherland Shire Council

Sydney Trains

TAFE Infrastructure NSW

Tasports

Unitywater

Water Corporation

## BRONZE

ANSTO

APP Corporation Pty Ltd

Arup

Assetivity Pty Ltd

Atos (Australia) Pty Ltd

Baker Hughes Digital Solutions Australia Pty Ltd

Ballance Agr-Nutrients

Beca

BetterAIM Pty Ltd

Brightly Software Pty Ltd

Brisbane Airport Corporation

CBC Facilities Maintenance

City of Port Adelaide Enfield

Covaris Pty Ltd

Cushman and Wakefield

DAS Consulting

Defence Estate Infrastructure, NZDF

Delta Facilities Management Pty Ltd

Department of Jobs, Precincts & Regions

Department of Planning, Industry & Environment

Department of Transport ITS Asset Management Section

Department of Treasury and Finance

Egis Oceania Pty Ltd

Fremantle Ports

Gladstone Area Water Board

Gladstone Regional Council

Global-Mark Pty Ltd

Goulburn Valley Health

Goulburn Valley Water

Hardcat Pty Ltd

Harvey Water

Horizon Power

Hunter Water Corporation

Innovative Thinking IT

Ipswich City Council

Lake Maintenance Corporate Pty Ltd

Landcom

LogiCamms

Logsys Power Services

Lucid Consulting Australia

LYB Operations & Maintenance Pty Ltd

Maca Infrastructure

Melbourne Water

Meridian Energy

Monash University

Nexus Global Australia

North East Water

Northern Territory Government Dept. of Infrastructure, Planning & Logistics

NRG Gladstone Operating Services

Office of Sport

Ontoit Global Pty Ltd

OpenMove

Orica

Oropesa Port Management Pty Ltd

Pacific Hydro

Port Botany Operations ATF Port Botany Unit Trust

Powerlink Queensland

Professional Construction Strategies Group Ltd

QENOS

Quality Management Australia

Quarterbac

Queensland Rail

Reeves Group Services Pty Ltd

Refining NZ

Retriever Communications

Rockfield Technologies Australia Pty Ltd

SA Water Corporation

School Infrastructure NSW

SEQWATER

Shoalhaven Water

Silver Edge Technologies Pty Ltd

SPM Assets

SPM Assets Ltd

STRUCTURED CHANGE PTY LIMITED

Strukton Rail Australia Pty Ltd

Talis Consultants

Taronga Conservation Society Australia

TasWater

TATWEER MIDDLE EAST AND AFRICA L.L.C.

Terotek (NZ) Limited

Townsville City Council

Unison Networks Limited

United Energy Services Pty Ltd

Valmec Limited

Victoria State Emergency Service WaterNSW

Wesfarmers Chemical Energy and Fertilisers

Windlab

Worley Power Service

Yarra Ranges Council



ASSET MANAGEMENT COUNCIL

THE  
**ASSET**  
JOURNAL

Asset Management Council

PO Box 2004  
Oakleigh Vic 3166

Tel 03 9819 2515

[www.amcouncil.com.au](http://www.amcouncil.com.au)