Resource efficiency guideline for infrastructure delivery and maintenance

August 2023

Version 2

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WAKA KOTAHI
NZ TRANSPORT AGENCY

Te Kāwanatanga o Aotearoa
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More information

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Cover image: Demolition of the old Park Estate Road bridge (part of the Papakura to Drury project), May 2022 – more than 400 tonnes of material was recovered for reuse, including concrete and 30 tonnes of reinforcing steel.

Contents

1 Introduction

1.1 Overview

This guideline document supports the Resource Efficiency Policy for Infrastructure Delivery and Maintenance and *P48 Specification for resource efficiency for infrastructure delivery*.

The guideline provides an overarching methodology for incorporating resource efficiency into Waka Kotahi infrastructure and maintenance projects. It aims to stimulate new approaches and support the adoption of more efficient ways of managing and delivering transport infrastructure. By prioritising the integration of resource efficiency and whole-of-life carbon consideration from the early business case phasing, Waka Kotahi seeks to promote innovative and circular design approaches, supporting project teams throughout the project lifecycle on the critical opportunities and decisions needed to minimise the consumption of raw materials, energy and water and to reduce waste.

The integration of resource efficiency in infrastructure and maintenance projects will provide an enhanced foundation to build towards a more sustainable future, providing greater economic value and fostering improved service with fewer resources and less waste, and reducing unwanted environmental impacts and effects. This is in line with the Waka Kotahi commitment in Te Hiringa o te Taiao – Our Resource Efficiency Strategy to use resources sustainably with minimal environmental impact.

The purpose of this guideline is to enable the Resource Efficiency Policy and the P48 specification to be implemented by providing supporting guidance for developing a resource efficiency and waste minimisation plan (REWMP), evaluating opportunities, target setting and reporting, and providing practical guidance to infrastructure improvement projects at all project life cycle phases, as well as maintenance contracts.

1.2 Background

As per section 96(1)(a) of the Land Transport Management Act 2003 (LTMA), Waka Kotahi NZ Transport Agency is required to exhibit a sense of environmental and social responsibility. To give effect to this, Waka Kotahi has an Environmental and Social Responsibility Policy (ESR policy) that sets out the Waka Kotahi commitment to reducing emissions and mitigating the effects of land transport on the environment and public health, and the aim to use resources sustainably and efficiently, reduce waste and transition to low-carbon infrastructure and services that support a circular economy. The commitment to reduce emissions is further reiterated in the Climate Change Policy for Land Transport Activities.

External requirements for resource efficiency reporting include the Waste Minimisation Act 2008 and associated regulatory requirements to measure waste and diverted materials. In addition, the Carbon Neutral Government Programme (CNGP) requires participants, including Waka Kotahi, to report on both corporate emissions and material scope three emissions. Scope three emissions include emissions associated with infrastructure construction, maintenance and operational activities.

Waka Kotahi released Toitū te Taiao – Our Sustainability Action Plan in April 2020. This plan identifies how Waka Kotahi will operationalise its commitment to environmental sustainability and achieve ‘a low carbon, safe and healthy land transport system’. Toitū te Taiao acknowledges four challenges: reducing greenhouse gas emissions, improving public health, reducing environmental harm and reducing Waka Kotahi corporate emissions. Toitū te Taiao highlights resource efficiency as one of the key ways that Waka Kotahi can reduce environmental harm. Accordingly, Toitū te Taiao identifies sustainable use of resources and energy as one of the Waka Kotahi long-term outcomes for 2050.

As part of workstream three in Toitū te Taiao, Waka Kotahi developed Te Hiringa o te Taiao – Our Resource Efficiency Strategy, released in 2021, which presents our vision for resource efficiency: to use resources sustainably with minimal environmental impact.

Te Hiringa o te Taiao identifies the following focus areas (outcomes) for improving resource efficiency:

1. sustainable sourcing and use of resources
2. waste minimisation

3. reduced energy and carbon.

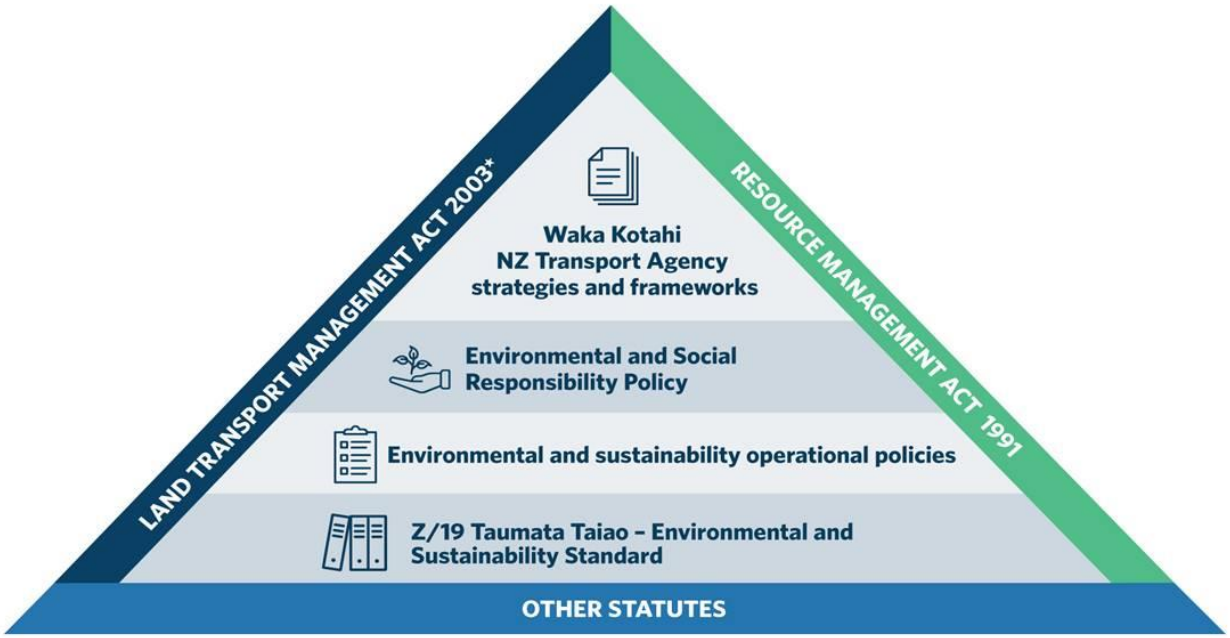


Figure 1-1: Waka Kotahi environmental policy framework

In Te Hiringa o te Taiao, Waka Kotahi recognises the need to fully integrate established resource efficiency policies and specifications into the decision-making processes and supplier contracts of Waka Kotahi. To address this need, Waka Kotahi developed the Resource Efficiency Policy and accompanying P48 specification to establish resource efficiency requirements for Waka Kotahi improvement projects and maintenance contracts, as well as other projects that have been allocated funding from the National Land Transport Fund.

This guideline is not restricted to use on Waka Kotahi projects. There may be benefits in applying it across council-led infrastructure projects or other construction projects where resource efficiency opportunities exist.

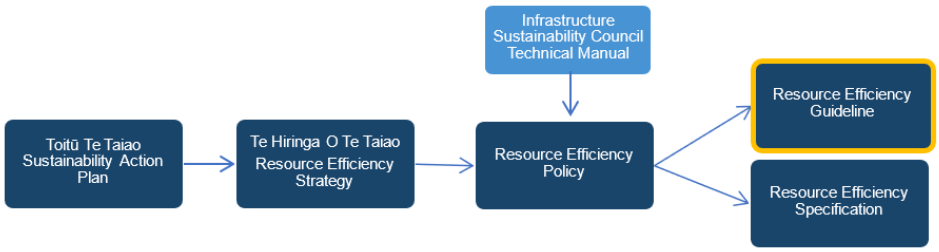


Figure 1-2: Key policy and strategy drivers for the Resource efficiency guideline

1.3 Purpose of this guideline

The purpose of this guideline is to provide direction on implementing the Resource Efficiency Policy and P48 specification. It outlines methodologies for evaluating opportunities, developing a resource efficiency and waste minimisation plan and reporting during project implementation. This includes practical guidance for infrastructure improvement projects and maintenance contracts at all project lifecycle phases.

This guideline is intended for use by:

- consultants, contractors, project managers and stakeholders who participate in the planning, design, construction, and maintenance of the land transport system
- Waka Kotahi staff whose work and actions affect resource efficiency.

1.4 Definitions and abbreviations

Table 1-1: Resource efficiency measures

Measure	Measure definition	Unit
Total energy	Total energy used (both fuel and electricity)	Electricity – kilowatt hours (kWh) Petrol and diesel – litres (L)
Total material	Total materials (tonnes), including recycled/virgin data	Tonnes (t)
CO_2 energy	Greenhouse gas (GHG) emissions from total energy (both fuel and electricity)	Tonnes of carbon dioxide equivalent (tCO_2e)
CO_2 materials	Embodied GHG emissions from total materials	Tonnes of carbon dioxide equivalent (tCO_2e)
Carbon footprint	Sum of CO_2 energy and CO_2 materials	Tonnes of carbon dioxide equivalent (tCO_2e)
Waste to landfill and cleanfill	Total waste disposed to landfill and cleanfill	Tonnes (t)
Waste recycled	Total waste diverted (reused, recycled, recovered) from landfill by material type	Tonnes (t)
Total waste	Sum of waste to landfill and cleanfill + waste recycled	Tonnes (t)
Total water	Total water from construction, maintenance and operations; including potable / non-potable split.	Megalitre (ML)

Table 1-2: List of abbreviations

Abbreviation	Definition
BCR	Benefit–cost ratio
CO_2e	Carbon dioxide equivalent
DBC	Detailed business case
ESMP	Environmental and social management plan
ESR	Environmental and Social Responsibility Policy
GHG	Greenhouse gas
ILM	Investment logic map
ISC	Infrastructure Sustainability Council
KPI	Key performance indicator
KRA	Key result area
LCAP	Life Cycle Assessment Pavement Tool
LTMA	Land Transport Management Act 2003
MCA	Multi-criteria analysis
PEET	Project Emissions Estimation Tool
SMP	Sustainability management plan
REWMP	Resource efficiency and waste minimisation plan

1.5 Scope

This guideline details the inclusion of resource efficiency considerations across a project lifecycle and sets out the recommended approach for projects to take to implement the requirements associated with the Resource Efficiency Policy and P48 specification.

The term 'resource efficiency', in the context of this document, the Resource Efficiency Policy and P48 specification, relates to:

- reduced energy consumption (which will also reduce greenhouse gas emissions)
- increased uptake of recycled, re-used and alternative materials
- reduced use of virgin and high carbon intensity materials
- reduced waste
- reduced water consumption.

All Waka Kotahi **infrastructure improvement projects** will consider resource efficiency in accordance with the P48 specification and this guideline and complete the following:

- evaluate opportunities for resource efficiency during the early business case phases and at subsequent project stages
- develop a resource efficiency waste management plan (REWMP)
- report on energy use, material use, carbon footprint, water consumption[1] and waste, if the project is of 12-months duration or longer.

In accordance with the Resource Efficiency Policy, **maintenance contracts** will:

- develop a REWMP to identify and implement resource efficiency opportunities
- submit at least one resource efficiency initiative for assessment within their environmental key performance indicators (KPIs)
- report on energy use, material use, carbon footprint, water consumption and waste management/reduction at least annually.

Note about reducing greenhouse gas emissions: the scope of this guideline includes emissions associated with materials and activities used in construction, operation and maintenance of transport infrastructure. This guideline does not address enabled emissions from vehicles using the infrastructure.

To support the reduction in whole-of-life emissions from land transport infrastructure that is required by the Climate Change Policy for Land Transport Activities, Waka Kotahi is preparing guidance on assessing greenhouse gas emissions. That document will support this guideline by defining core emissions sources (construction and maintenance/operations), including end-of-life emissions, with useful guidance around application of an emissions factor hierarchy, noting the overall preference to align with the Project Emissions Estimation Tool (PEET – see section 3.1).

1.6 Z/19 Taumata Taiao – Environmental and Sustainability Standard

The Z/19 Taumata Taiao Environmental and Sustainability Standard provides a holistic approach to managing the interactions between the land transport system and the environment, setting out the requirements for how and when to implement Waka Kotahi environmental and sustainability policy, strategy and legislative requirements. Taumata Taiao covers eight core areas: climate change, biodiversity, social values, public health, cultural heritage, built environment, sustainable modes of transport, and resource efficiency and waste management. It includes key environmental and sustainability requirements for all Waka Kotahi projects and should be read in conjunction with this guideline.

1.7 Infrastructure Sustainability (IS) Rating Scheme

The Waka Kotahi Sustainability Rating Scheme Policy and *P49 Sustainability rating scheme application during tender and delivery of capital works projects* set out requirements for high-value projects. The

[1] Where water consumption is a regionally significant issue.

policy requires Waka Kotahi funded projects over $100 million to complete Infrastructure Sustainability Council (ISC) certification, and projects over $15 million to consider certification.

A decision on whether a project will complete ISC certification will be made prior to the detailed design phase. Further detail is provided in section 6.3 Detailed design.

As all Waka Kotahi funded projects are required to adhere to the Resource Efficiency Policy, projects completing ISC certification will still be required to report to Waka Kotahi on resource efficiency requirements.

However, the P48 and P49 specification requirements are intended to complement each other rather than compete or duplicate efforts. For example if a project is required to complete ISC certification then:

- reporting will follow the requirements for embodied carbon (materials), energy, water and waste in accordance with the P49 Sustainability Rating Scheme Specification, and
- the REWMP can be incorporated into the infrastructure sustainability management plan (SMP) for the project.

Guidance is provided in relevant sections of this guideline on how the two documents relate to one another and what action should be taken to satisfy both requirements.

1.8 Alignment in reporting

As resource efficiency opportunities are wide reaching, reporting needs to consider alignment between the Resource Efficiency Policy and other relevant requirements. Table 1-3 provides a high-level summary of key reporting requirements across P48, P49 and the Waste Minimisation (Information Requirements) Regulations 2021.

Key considerations include:

- alignment and incorporation of reporting requirements under the Waste Minimisation (Information Requirements) Regulations 2021, specifically addressing class 5: cleanfill reporting requirements for disposal and diversion activities
- where a project is completing ISC certification, reporting through to Waka Kotahi will be aligned with P49 specification and reporting timeframes, noting that ISC projects will address additional material categories than the P48 specification requirements, but all projects will need to align with the Resource Efficiency Policy.

Table 1-3: Resource efficiency reporting requirements

P48 Specification for resource efficiency for infrastructure delivery	P49 Sustainability rating scheme application during tender and delivery of capital works projects	Waste Minimisation (Information Requirements) Regulations 2021

• Total materials used (tonnes)
  • Total energy used (kWh)
  • Total waste (tonnes) to landfill/cleanfill
  • Total waste (tonnes) diverted from landfill/cleanfill
	• Energy efficiency and carbon reductions
	• Renewable energy
	• Resource strategy development
	• Resource recovery and management
	• Adaptability and end of life
	• Material lifecycle impact measurement and management
	• Avoiding water use
	• Appropriate use of water sources
		• The tonnage of material (disposed of or diverted) measured
		• How the tonnage was measured
		• The date the material entered the facility
		• The date and time the tonnage of the material was measured
		• If the tonnage of material was weighed using a weighbridge: the weighbridge ticket and vehicle registration
		• If the tonnage of material was measured using a conversion factor: the volume, the method for determining the volume and the conversion factor used
		• If the tonnage of material was ascribed under an average tonnage system, the type of vehicle the material was carried in

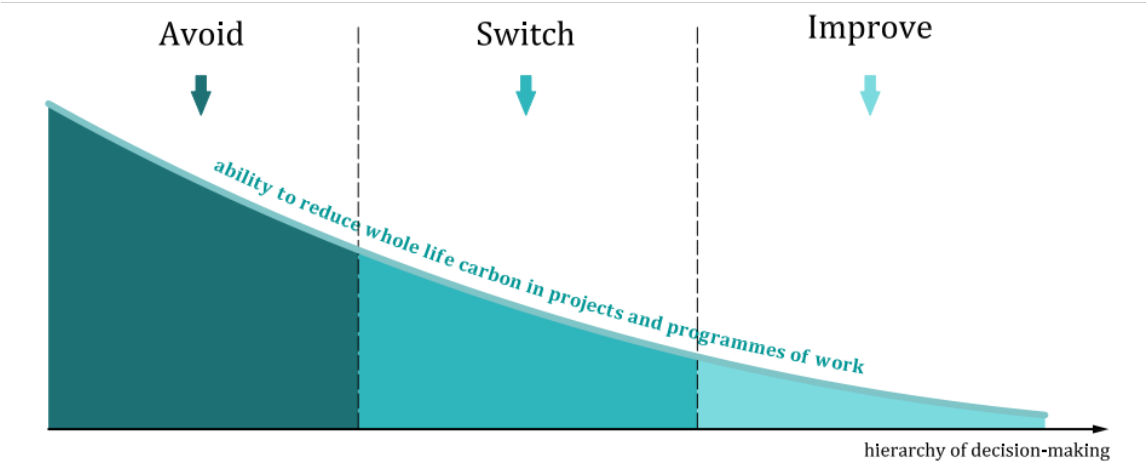
1.9 Te Rautaki Para – Waste Strategy

Te Rautaki Para – Waste Strategy was published in March 2023. This document provides direction to enhance New Zealand's performance on waste through to 2050. Implementation of the strategy will be driven through a series of action and investment plans and, in time, will be supported by updated legislation. It has a strong focus on reducing the waste we produce and improving recovery of materials, and also addresses the broader responsibility for sources of waste, including the management of contaminated land. In a resource efficiency context, a preference to re-use contaminated soils, promote sustainable remediation and reduce materials requiring disposal to landfill is a core component of Goal 8. This, and the shift towards a society that values materials, will support greater resource efficiency and innovation opportunities.

1.10 PAS 2080

This guideline aligns with the PAS 2080 low-carbon hierarchy. Although the hierarchy is specific to carbon, it also applies to other environmental and economic considerations, including resource efficiency.

In March 2023, the PAS 2080 framework was updated with a new streamlined approach for managing carbon in infrastructure projects. The updated approach converts the original hierarchy of build nothing, build less, build clever and build efficiently into three new decision points: 'Avoid, switch and improve'. Like the original hierarchy, the ability to reduce whole-of-life carbon reduces over time, with the greatest ability to influence change occurring at earlier stages, where objectives and outcomes for a project are still being developed and assessed. See Figure 1-3 below.



***NOTE** This figure represents a simplified and streamlined version of the carbon reduction hierarchy presented in PAS 2080:2016 and the* Infrastructure carbon review *[1]. It has been updated to clarify its applicability and relevance to a wider range of projects and programmes within the built environment (i.e. to clarify that the carbon reduction hierarchy is not solely about new builds).*

Figure 1-3: PAS 2080 (2023) hierarchy of decision-making

The three decision stages in the updated PAS 2080 (2023) guidance are described as:

- **Avoid**: align the outcomes of the project and/or programme of work with the net zero transition at the system level and evaluate the basic need at the asset and/or network level.
- S**witch**: assess alternative solutions and then adopt one that reduces whole life emissions through alternative scope, design approach, materials, technologies for operational carbon reduction, among others, while satisfying the whole life performance requirements.
- **Improve**: identify and adopt solutions and techniques that improve the use of resources and design life of an asset/network, including applying circular economy principles to assess materials/products in terms of their potential for reuse or recycling after end of life.

These three decision points are described relative to the implementation of resource efficiency approaches as below:

- During the initial business case for a project – that is, at project concept stage (point of entry) and early business case stages – **build nothing (avoid)** should always be considered. This might involve assessing whether systems can be adapted rather than building new infrastructure. While opportunities for building nothing diminish as a design develops, the do-nothing approach should always be considered as an alternative and therefore carried forward as an option.
- Moving into the more detailed business case phases, project teams should identify resource efficiency opportunities via the **build less (avoid)** principle. This involves maximising the use of existing assets and optimising asset operation to reduce energy and materials input over time, including design for resilience over the lifetime of the infrastructure.
- Once a preferred option is selected, **build clever (switch)** and **build efficiently (improve)** principles will support the development of resource efficiency opportunities during detailed design and construction. Opportunities can then be finalised in a REWMP and monitored through annual reporting to Waka Kotahi.

Figure 1-4 illustrates that the ability to influence resource efficiency on project changes over time.

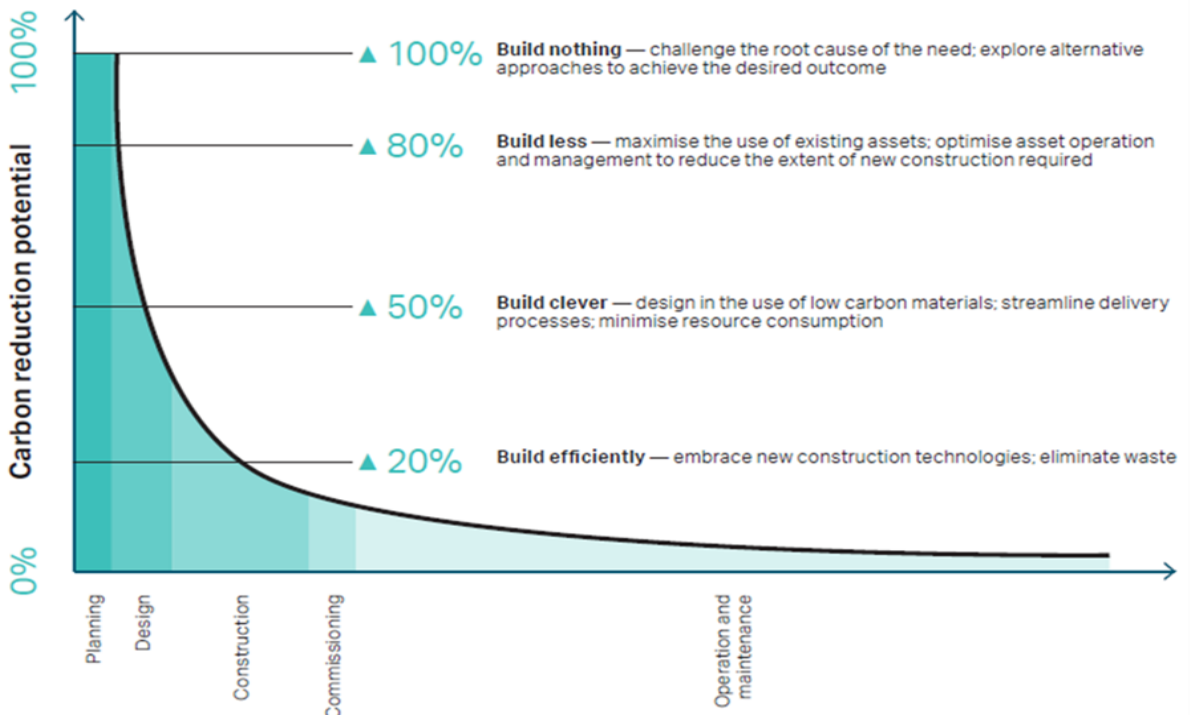


Figure 1-4: Resource efficiency improvement potential over project phases. Source; World Green Building Council; 2019; Bringing embodied carbon upfront.

Once a preferred option is selected, **build clever** and **build efficiently** principles will support the development of resource efficiency opportunities during detailed design and construction. Opportunities can then be finalised in a REWMP and monitored through annual reporting to Waka Kotahi.

2 Guideline structure

This guideline is structured to support easy navigation between sections, relevant to the type of project (tier 1, 2 or 3) and stage of project lifecycle (business case, tender phase, detailed design, construction, or maintenance).

This guideline is separated into the following sections relative to different stages in the delivery of infrastructure improvement projects or maintenance contracts:

- Key tools
- Options development

- Business case development
- Tender, design, construction and maintenance phases
- Target setting and carbon estimation
- Preparing a resource efficiency and waste minimisation plan (REMWP)
- Reporting on resource efficiency.

2.1 Project and maintenance contract tiers

Waka Kotahi infrastructure improvement projects and maintenance contracts are categorised into three project tiers (tiers 1–3), dependant on complexity and overall cost. Use Table 2-1 to identify which tier your project or maintenance contract falls within.

Table 2-1: Identification of project or maintenance contract tier

Tier	Infrastructure improvement projects	Maintenance contracts
Tier 1	>$15m and >12 months	Alliance model (excluding Milford Road)
Tier 2	$2–$15m or >$15m and <12 months	Network outcome contracts (NOC) and Milford Road Alliance Structures >$2m
Tier 3	<$2m (Excluding property acquisition)	Structures <$2m Street and traffic light Traffic counting High speed data

Once a project tier has been established, the next step is to identify the appropriate lifecycle phase to understand which requirements are relevant to your project and what part of this document to reference for guidance.

2.2 Requirements by project phase

The degree to which resource efficiency needs to be considered will vary depending on the type and tier of project being delivered. A high-level overview of the REWMP elements by project lifecycle are described in Figure 2-1. A summary of the detailed requirements (by tier) is provided in the navigation table (Table 2-2) below.

In order to establish resource efficiency considerations appropriately across a project lifecycle it is important to consider the relevant project phases shown in Figure 2-1.

Figure 2-1: Waka Kotahi project phases

Dependant on project scale, resource efficiency may be a central (or lesser) focus during the early phases of business case development, with options development continuing through to detailed design. In general, resource efficiency opportunities will arise earlier in tier 2–3 projects (lower complexity) than for tier 1 (complex, high value) projects.

Resource efficiency requirements are described by applicable project phase in Figure 2-2. This graphic provides an overarching view of the key activities to enable projects to deliver a suitable resource efficiency waste management plan (REWMP) and the associated reporting to Waka Kotahi.

Application of the PAS 2080 hierarchy supports development of resource efficiency across a project's lifecycle, with a focus on maximising project value.

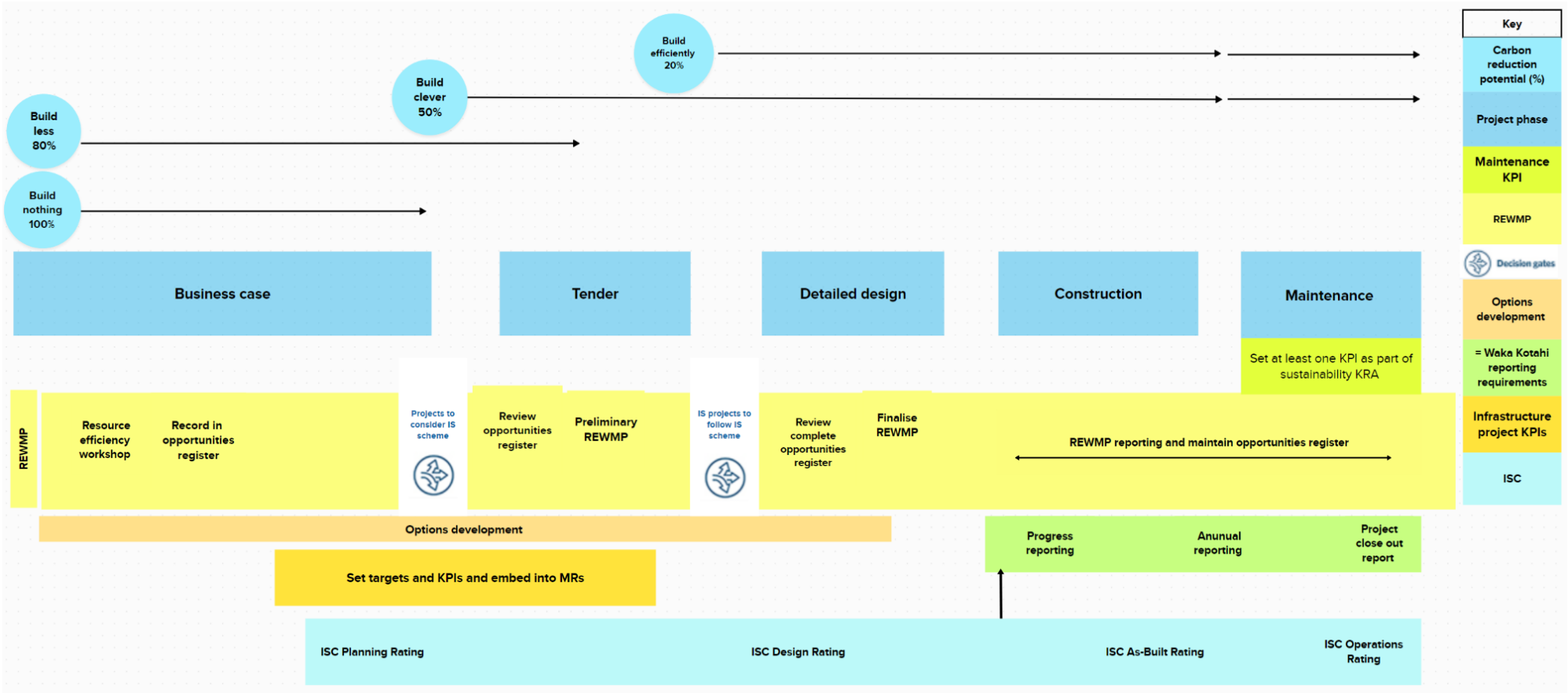


Figure 2-2: Resource efficiency by project phase

2.3 Navigation

The following table describes the project phases and resource efficiency requirements at each stage, providing an easy-to-follow navigation for this document and for completing the relevant activities in each phase of works.

As part of options development, it is recommended that all projects complete a resource efficiency workshop and establish an opportunities register to demonstrate they have met the Resource Efficiency Policy requirement to evaluate opportunities for resource efficiency during the early business case phases and at subsequent project stages. The register will continue to be updated through project phases and completed during project delivery/maintenance phases.

A critical stage of the business case phases is to establish evaluation criteria for resource efficiency opportunities. Evaluation criteria should be revisited throughout each project phase to ensure ongoing suitability/applicability, noting that for tier 1 projects we recommend including resource efficiency criteria in the multi-criteria analysis (MCA) screening process.

During tender and project delivery phases identified opportunities are evaluated, and applicable materials/approaches should be detailed in the preliminary and final REWMP. The measurement of resource efficiency outcomes will be addressed through progress and close-out reporting.

Table 2-2: Navigation table

Activity	Business case phases			Tender phase			Project delivery – infrastructure improvement projects			Project delivery – maintenance contracts			Part-funded projects
	Tier 1	Tier 2	Tier 3	Tier 1	Tier 2	Tier 3	Tier 1	Tier 2	Tier 3	Tier 1	Tier 2	Tier 3	All
Options development and opportunities identification													
Resource efficiency workshops	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Develop an opportunities register	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Complete the opportunities register	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓
Investigation analysis criteria	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Evaluate opportunities	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
Complete an MCA	✓	-	-	-	-	-	-	-	-	-	-	-	✓
Target setting and carbon estimation													
Setting a carbon base case	✓	✓	-	✓	✓	-	✓	✓	-	✓	✓	-	-
Setting targets	✓		-	✓		-	✓		-	-	-	-	-
Preparing a resource efficiency waste minimisation plan (REWMP)													

Activity	Business case phases			Tender phase			Project delivery – infrastructure improvement projects			Project delivery – maintenance contracts			Part-funded projects
Prepare preliminary REWMP	-	-	-	✓	✓	-	-	-	-	-	-	-	-
Prepare REWMP	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	-
Reporting on resource efficiency													
Progress reporting	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	-
Report on resource efficiency initiative(s)	-	-	-	-	-	-	-	-	-	✓	✓	✓	-
Project close out report	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓
Develop Waka Kotahi case studies	-	-	-	-	-	-	✓	✓	-	✓	✓	-	-

3 Key tools

Two key tools available for supporting the consideration of greenhouse gas emissions early in the business case process include the Project Emissions Estimation Tool (PEET) and Life Cycle Assessment Pavement Tool (LCAP). These tools support option selection in the early business case phases, with more detailed data to be reported at project completion using the resource efficiency reporting tool.

For guidance on specific tool inputs, see Waka Kotahi *Guideline for assessing greenhouse gas emissions from land transport infrastructure*.[2]

3.1 Project Emissions Estimation Tool

The Waka Kotahi Project Emissions Estimation Tool (PEET) is an emissions estimation tool that has been developed for use in the early stages of a land transport infrastructure project. Information from PEET can be used to inform decisions on a project or programme business case and to estimate emissions for different design options.

Note: PEET does not replace the IS Materials Calculator for those projects pursuing ISC certification.

3.2 Life Cycle Assessment Pavement Tool

The Waka Kotahi Life Cycle Assessment Pavement Tool (LCAP) is a tool to help understand the whole-of-life carbon impacts of different pavement designs, including the use of recycled materials or reuse of existing pavement layers. Information from LCAP can be used alongside technical and cost calculations to guide pavement design choices at the detailed business case and detailed design phases, as well as for maintenance contracts.

3.3 Multi-criteria analysis

Multi-criteria analysis (MCA) is a powerful tool for evaluation of qualitative and quantitative outcomes, Waka Kotahi have developed a transport-specific MCA template and guidance, which can be used to evaluate resource efficiency opportunities across a project lifecycle. We recommended that all tier 1 infrastructure improvement and part-funded projects complete an MCA that includes criterion for resource efficiency. See section 5.3 for more detail on application of an MCA during business case phases.

[2] Currently in draft. Contact environment@nzta.govt.nz for guidance.

4 Options development and opportunities identification

4.1 Options development

When formulating alternatives and options as part of the business case process, the PAS 2080 low-carbon hierarchy should be applied (starting from 'build nothing' and 'build less' principles).

Additional considerations include:

- Consider a full range of options – include at least one option that optimises resource efficiency (assuming a 'build' option is being taken forward).
- Consider how options could be broadened to achieve a better resource outcome.
- Consider how options could be packaged together to achieve a better resource outcome.
- Challenge 'gold plating' (incorporating costly and unnecessary features).

4.2 Opportunities identification

Identification of resource efficiency opportunities should begin as early in the project as possible, to ensure opportunities are realised at an appropriate time and to allow sufficient time for implementation.

Technical guidance for evaluating resource efficiency and circular design opportunities (nzta.govt.nz). is available to support projects and maintenance contracts.

Opportunities identification can be coordinated through a workshop with relevant parties, including representatives from senior leadership and stakeholders from various areas and levels of the project. Resource efficiency workshops should be scaled according to the size of the project: from a multi-disciplinary workshop for larger projects, to a simple meeting for small projects. See Table 4-1 below for examples of workshop participants by project complexity.

Table 4-1: Resource efficiency workshop attendees

Tier 1	Tier 2	Tier 3
Multi-disciplinary group of people who can collectively provide a good overview of the project. Ideally with an impartial facilitator in a workshop setting.	Multi-disciplinary group of people who can collectively provide a good overview of the project. Workshop setting may be appropriate.	One or two project leads. A meeting may be sufficient to identify opportunities.

A resource efficiency workshop specifically focused on resource efficiency opportunities and applicability to the project should be held with all applicable stakeholders.

Regardless of project tier (or complexity), all opportunities should be recorded in a project opportunities register, along with assignment of an opportunity owner. The opportunities owner is assigned responsibility for investigating the opportunity and recording findings in the register. In order to establish and maintain accountability throughout the project, a representative of the project leadership team should have overarching responsibility for review alongside the opportunities owner.

The opportunities register provides a critical repository of potential opportunities that may be considered in future evaluation stages and should also be revisited in the first draft of the project REWMP. For example, the use of recycled materials is one aspect that should be evaluated during the opportunities identification. Key criteria to consider are listed in Table 4-2. Supporting guidance is available to assist with assessing potential environmental harm of alternative materials.

Table 4-2 Criteria for assessing use of recycled materials

Criteria	Explanation
1. Does the recycled material meet engineering specifications?	If not, a departure may have to be sought.
2. Does the recycled material have quantifiable metrics for comparison?	For example, a lifecycle assessment or environmental product declaration
3. Do the environmental benefits outweigh the harm?	For example, recycled plastic in materials such as concrete may have a higher environmental footprint over its life due to the difficulties in disposing it at the end of life.
4. Are sufficient quantities of the recycled product available?	Some recycled products, such as recycled concrete, are not readily available in large quantities.
5. Is it a trial that, if successful, could be replicated on other Waka Kotahi projects?	Trials that could be replicated across multiple projects should be looked upon more strongly than one-offs, and a case study can be produced.

Notes on using the Waka Kotahi opportunities register

- The consideration and evaluation of resource efficiency opportunities can be right-sized for each project and project phase. For tier 2 and 3 projects with less complexity a discussion-based approach may be sufficient, while for larger or more complex projects, including tier 1 projects, an MCA should be considered.
- Opportunities can be parked in the opportunities register should they be required at a later stage in the process (see appendix A).
- In addition to tracking the opportunities and assigning an owner, the opportunities register can also be used to plan implementation of the initiatives identified, using the implementation plan tab. This is a useful activity tracker and can be updated as required.

5 Business case development

Tools/useful links:

- ✓ Waka Kotahi project opportunities register (appendix A)
- ✓ Investment logic mapping (ILM)
- ✓ Multi-criteria analysis (MCA)
- ✓ Project Emissions Estimation Tool (PEET)
- ✓ Early assessment sifting tool (EAST)
- ✓ Life Cycle Assessment Pavement Tool (LCAP)
- ✓ Business Case Approach guidance

5.1 Overview

The Waka Kotahi Business Case Approach (BCA) supports clarity of thinking and is designed to ensure that proposed investment outcomes align with government priorities and strategies. The BCA includes investment decision gates to ensure decisions are cost-effective and linked to strategic outcomes. It also provides an opportunity to review resource efficiency considerations as the business case develops. This includes utilising existing tools and resources to identify and quantify resource efficiency opportunities.

During the early business case phases, focus should be on the 'big picture' resource efficiency opportunities, including:

- overall use of resources, such as avoiding building in the first place and repurposing existing assets (such as structures and pavements)
- operational efficiencies, such as reducing reliance on significant energy-using activities in the operational phase (for example, tunnel air ventilation or groundwater pumping)
- avoiding significant use of high-carbon materials (concrete and steel) in the design and construction phase (for example, decisions around structures versus embankments and culverts)
- taking a 'whole-of-life' approach to resources – considering the overall best opportunities for resource efficiency over the asset's lifetime (for example, choosing infrastructure with lower maintenance requirements or increased durability, taking into account potential for increased initial material use or cost).

We recommend that resource efficiency input is provided by a specialist with experience in the sustainability field and business case processes if possible. This input could include attendance at ILM workshops and providing input into MCA. Waka Kotahi subject matter experts should also be brought in at each step to advise on relevant issues, for more information contact environment@nzta.govt.nz

5.2 Business case phases

It is likely that opportunities for resource efficiency will evolve throughout a project. They will also vary depending on the business case phase. Key resource efficiency considerations across business case stages are included in Table 5-1 below.

Table 5-1: Resource efficiency considerations by business case phase

Business case phase objectives	Considering resource efficiency in this phase	Relevant tools and processes
Point of entry		
This first step determines whether the proposed investment aligns with Waka Kotahi strategic priorities and, if so, the appropriate business case pathway to be taken. Many projects will proceed directly to the single-stage business case (SSBC) (particularly those that are simple and/or low risk) or to the indicative business case (IBC) phase.	During the point of entry, the resource efficiency context relevant to the problem/opportunity needs to be understood. **Resource efficiency challenge points:** • Is the potential investment well aligned to strategic priorities for resource efficiency? • Can we build nothing?	None
Strategic case		
Not all projects will require standalone a strategic case phase, but the strategic case will be the foundation of the business case in any subsequent phase. The objective of the strategic case is to establish the case for change and to identify both the transport and broader benefits (and disbenefits) to be gained from an investment, so that the rationale behind the business case decision is clearly set out.	This phase is focused on identifying the transport outcomes sought (rather than the infrastructure to deliver them). The strategic case should expand on the policy context developed for the point of entry. **Resource efficiency challenge points:** • Is the potential investment well-aligned to strategic priorities for resource efficiency? • Could the scope be adjusted to maximise resource efficiency? • Is resource efficiency one of the primary reasons for investing? Or a major benefit of investing? If the answer to the above prompts is **yes**, consider resource efficiency in the problem and benefits definition and investment objectives (which are usually developed using ILM). If **no,** consider how	Investment logic mapping (ILM)

Business case phase objectives	Considering resource efficiency in this phase	Relevant tools and processes
	resource efficiency is to be considered throughout the business case process (e.g., in the MCA of options).	
Programme business case (PBC)		
Programme business cases typically comprise several related projects and activities that will be completed in tranches over an extended period to achieve an integrated outcome.	Focus during a PBC should be on the 'big picture' resource efficiency opportunities and potential staging, e.g., the role of recovered materials as inputs for other project activities. For each option, the relative scale of resource efficiency challenges and opportunities should be understood. Qualitative and/or quantitative analysis can be used to inform options selection. **Resource efficiency challenge points:** • Can we build less? If yes, include non-construction options, e.g., land-use optimisation, travel demand management etc. • Can we modify the scope of programme to make use of existing assets or reduce new construction? If yes**,** identify assets that can be repurposed or upgraded for inclusion in the long list of options (e.g., use existing corridor, pavements, structures). • Consider resource efficiency during 'coarse screening' of options (using EAST). Qualitative assessment may be appropriate at this stage, but PEET could provide high level quantitative data if information is available.	Multi-criteria analysis (MCA) Project Emissions Estimation Tool (PEET) (1st order estimate) Early assessment sifting tool (EAST)
Indicative business case (IBC)		
An IBC tends to be completed for large or complex projects. The objective is to develop a wide-ranging, longlist of potential options and apply MCA to refine these into a shortlist for consultation and/or subsequent more detailed evaluation.	Each longlist option should be considered in terms of resource efficiency benefits, to ensure applicable opportunities are shortlisted as appropriate (and progressed to DBC). **Resource efficiency challenge points:** • Are options resource intensive (e.g., significant use of high carbon materials such as concrete and steel)? • Do options have significant operational resource needs (e.g., energy)? If the answer to the above prompts is yes: - Challenge the need to build, explore alternatives to deliver the required outcome. - Optimise asset operation to reduce need for new construction and identify assets that can be repurposed or upgraded. - Improve design of the option(s) to minimise resource use and eliminate waste.	MCA PEET (1st and/or 2nd order)
Detailed business case (DBC)		
The DBC identifies the preferred option. This involves confirming previous phases of business case planning and providing a detailed consideration of technical	The DBC includes detailed reporting of economic, financial and commercial aspects of the activity and therefore provides a critical decision point to consider resource efficiency opportunities in the context of the	MCA PEET (2nd or 3rd order)

Business case phase objectives	Considering resource efficiency in this phase	Relevant tools and processes
requirements and assessment of the risks and uncertainties associated with options. A specimen design for the preferred option is then developed.	broader project. An initial resource efficiency opportunities register should be prepared. Use the IBC resource efficiency challenge points.	Life Cycle Assessment Pavement Tool (LCAP) Opportunities register (appendix A)
Single-stage-business case (SSBC)		
For simpler/smaller/low-risk projects a SSBC combines the optioneering (IBC) and detailed development (DBC) steps into a single document, although these stages should remain distinct decision points.	Each of the elements described above for the IBC and DBC should be clearly presented in the SSBC. Detail to be provided on how resource efficiency has been considered during option identification and selection, and the rationale for selection of a shortlist and the preferred option. An initial resource efficiency opportunities register should be prepared. Use the IBC resource efficiency challenge points.	MCA PEET (2nd or 3rd order) LCAP Opportunities register (appendix A)
Continuous programmes (including low cost, low risk)		
Continuous programmes comprise small, low risk activities, largely aimed at maintaining existing levels of service, that are delivered as ongoing programmes.	The principles of the Business Case Approach are incorporated into the activity management planning cycle and provide an opportunity to demonstrate value for money. Resource efficiency opportunities should be considered in the regular investment cases associated with periodic funding approvals for continuous programmes.	

5.3 Multi-criteria analysis

MCA enables comparative assessment of quantitative and qualitative parameters to understand relative benefits of alternative options and compare these against an overarching outcome or target. During business case development MCA can help investors and project teams evaluate options at the longlist and at the shortlist phases to help identify a preferred solution.

MCA is often used in the options assessment process to compare options and help select a preferred option. Generally, they are done at the IBC and DBC stages or SSBC.

Business case developers should consider how resource efficiency aspects can be integrated into the MCA at the optioneering phase.

Three approaches to include resource efficiency aspects into an MCA are:

1. Use a stand-alone resource efficiency criterion in the effects assessment.

   For example: To what extent will the option impact carbon emissions from the use of materials (embodied carbon) and the use of energy (construction fuel)? To what extent will the option generate waste to landfill?

2. Integrate resource efficiency aspects into other relevant MCA criteria related to effects.

   For example: Constructability: Complexity and risk in construction (including consideration of earthworks cut/fill balance and material reuse, plant and equipment needs and by extension fuel use).

3. Include resource efficiency aspects into the opportunities assessment for the MCA. For example: To what extent are there opportunities to reuse materials for this option? To what extent are there opportunities to mitigate carbon emissions generation for the option?

Importantly, MCA criterion relating to resource efficiency should only be applied if the issue is likely to differentiate between the options. This is a general principle for the setting of all criteria in the BCA. In addition, the level of assessment (for example, qualitative or quantitative) should be right-sized for the individual business case.

If using a stand-alone criterion, it is important to clearly define what resource issue(s) the criterion includes. In determining this, the following should be considered:

- Is there a single resource effect that is significantly more important than others, as it relates to the options under consideration? Would there be the ability to differentially score the options using this criterion, with the information available?
- If there are multiple resource effects, consider how the criterion would be scored given the information available, and whether an overall effects score can be reached.

If integrating resource efficiency into other relevant criteria, then the following should be considered:

- Which criteria also have an element of resource effect?

  For example: Criteria that consider the number of bridges over streams/use of culverts intrinsically involve material use; geotechnical criteria intrinsically involve cut/fill ratios and therefore construction fuel use.

- How the resource effect is included in the scoring by the lead specialist for the criterion.

If including resource efficiency aspects in an opportunities assessment, then it is possible to separate out individual aspects to facilitate scoring or qualitative assessment as required. Guidance should be sought from the project MCA specialists and/or Waka Kotahi subject matter experts to determine the appropriate number of criteria.

In all circumstances, it is advisable that effects and opportunities scoring or qualitative assessment for resource efficiency aspects are undertaken by a specialist with experience in the sustainability field and business case processes if possible. A summary of pros and challenges associated with each approach are listed in Table 5-2 below.

Table 5-2: Resource efficiency opportunities

Use	Pros	Challenges
Use of stand-alone resource efficiency effect criterion approach	Transparent scoring for resource efficiency	Risk of double counting with investment objectives or other criteria that incorporate resource efficiency aspects
	Criterion can be tailored to a specific resource effect	Option information may not be available for all resource aspects
	Can have single criterion owner, ideally a sustainability practitioner	If multiple issues combined into one criterion, may not turn out to be a significant differentiator for the options
Integration into other effects criteria approach	Resource effect score included in overall criterion score, so low risk of double counting	Not as transparent for understanding how or where resource aspects have been assessed
	Resource effect consideration aligned to activity or issue that generates the effect	Multiple resource effects split across multiple criteria needs careful identification

Inclusion in opportunities assessment approach	Single or multiple criteria can be selected to score or qualitatively assess opportunity potential	Opportunities assessment may have less weight in decision making compared to effects assessment
	A focus on opportunities supports mitigation actions for effects	Risk of opportunities not being carried forward into subsequent phases unless proactively managed
		A robust assessment of opportunities would benefit from provision of evidence to support magnitude of positive impact

Use of resource efficiency criteria in the MCA process should be documented in the economic case (optioneering assessment) section of the business case and be reflected in the MCA scoring.

Waka Kotahi guidance on MCA, including a template, is available on our website: Multi-criteria analysis

5.4 Handover

A robust handover is to be completed at the end of every Waka Kotahi project phase. This is particularly important at the start of construction (pre-implementation and procurement).

The Z/19 Taumata Taiao – Environmental and Sustainability Standard provides a holistic approach to managing the interactions between the land transport system and the environment, setting out the requirements for how and when to implement Waka Kotahi environmental and sustainability policy, strategy and legislative requirements. In accordance with the standard, handover is required to include information on several aspects of environment and sustainability, including resource efficiency targets and opportunities identified in the business case stages.

Documentation of the consideration of resource efficiency during business case development and subsequent resource efficiency opportunities should be included in the project handover documents. A quick checklist includes:

- Have resource efficiency opportunities been considered (relative to scale required at project phase)?
- Has a list of considered opportunities been completed (and recorded in the project opportunities register)?
- Have decision-making processes, including longlist and shortlist MCA, been included?

6 Tender, design, construction and maintenance phases

Tools/useful links:

- ✓ Project Emissions Estimation Tool (PEET) (for GHG emissions only)
- ✓ Waka Kotahi Life Cycle Assessment Pavement Tool (LCAP) (for GHG emissions only)
- ✓ Resource efficiency and waste minimisation plan (REWMP) template (appendix C)
- ✓ Waka Kotahi Resource Efficiency Reporting Tool (appendix B)
- ✓ ISC reference material

6.1 Overview

Once a project has had business case funding confirmed and has been released to market for design and construction related services, project teams should begin to focus on drafting, finalising, and implementing a REWMP.

This process will involve identifying, investigating, and implementing resource efficiency opportunities.

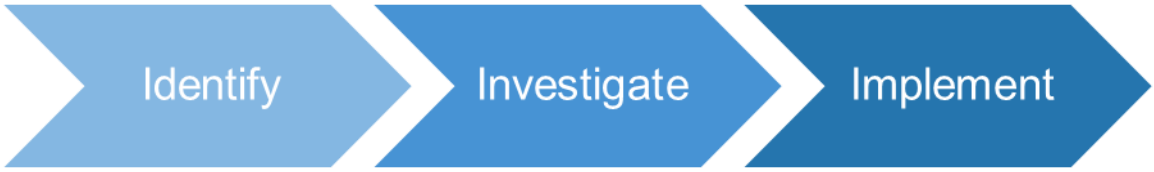


Figure 6-1: Opportunity evaluation process

Dependant on the scale and complexity of the project, a suitable rating system may apply (for example for Waka Kotahi projects >$100 million ISC certification is required). In these cases, the specific requirements of the rating system should be considered when completing a preliminary or draft REWMP.

6.2 Tender phase

For all projects that are subject to a tender process that includes design, all tenderers prepare a preliminary REWMP in accordance with P48. A preliminary REWMP should follow the same template as a full REWMP, however, given the early stage of the project, the information included may be indicative, with the preliminary REWMP updated with more definitive and detailed information as the project progresses.

The preliminary REWMP should, at a minimum, define the viable opportunities identified during earlier phases and as recorded in the opportunities register. The inclusion of identified opportunities, approaches, and draft project initiatives in the preliminary REWMP will provide a valuable guide for tenderers on the likely resource efficiency requirements. Following award, the contractor will assume responsibility for the preliminary REWMP and continue to refine, develop and implement resource efficiency opportunities.

6.3 Detailed design

At the detailed design phase, a decision will be made by Waka Kotahi on projects that will complete IS certification. All projects other than those requiring ISC certification will continue following the Resource Efficiency policy and P48 specification. For projects that require IS certification, the reporting requirements will differ, with these projects required to meet the specification requirements set out in both P49 and P48. Practically, this means that the information requirements outlined in the IS Rating will be reported alongside P48 through quarterly reports with an annual report that summarises implementation to date of P49 and P48 requirements.

6.3.1 P49 Sustainability rating scheme specification

The P49 specification outlines the requirements for implementation of the Waka Kotahi Sustainability Rating Scheme Policy. Where a project is required to complete ISC certification, the consultant or contractor will follow the requirements for embodied carbon (materials), energy, water and waste in accordance with P49 specification.

A decision to certify a project via the IS Rating Scheme will be made before detailed design begins. Projects over $15 million capital value are required to assess the merits of undertaking an ISC Rating and gain certification if appropriate. Projects over $100 million capital value will undertake an IS Rating unless there are strong non-monetised and monetised benefits and value-for-money arguments that it is not practical and that sustainability objectives can be achieved in an alternative agreed way.

Projects following the IS Rating Scheme will still be required to comply with the Resource Efficiency Policy and will need to report to Waka Kotahi on resource efficiency measures. To minimise duplication, the data reporting requirements for the Resource Efficiency Policy can be completed via ISC credit requirements for energy, carbon, water, and waste management. The sustainability management plan (SMP) can incorporate the REWMP requirements to avoid duplication of effort. Projects completing an ISC rating should plan for this alignment early.

Annual and quarterly reporting to Waka Kotahi can be completed via the reporting credit for the IS Rating Scheme – see Table 6-1. The IS ratings, designed to assess sustainability performance, are in a constant state of evolution, reflecting advancements in industry practices, emerging environmental considerations, and evolving societal expectations, thereby ensuring that projects are continuously evaluated against the most up-to-date sustainability standards. Table 6-1 provides example from v2.1, however, as the credits change names, it is recommended for projects to align with the current energy, water, and resource management credits.

Table 6-1: ISC credit categories for IS rating v2.1

Category	ISC credit	ISC credit title
Reporting and targets	Lea-1	Integrating Sustainability
Energy and carbon	Ene-1	Energy Efficiency and Carbon Reductions
	Ene-2	Renewable Energy
Resource efficiency and management	Rso-1	Resource Strategy Development
	Rso-4	Resource Recovery and Management
	Rso-5	Adaptability and End of Life
	Rso-6	Material Life Cycle Impact Measurement and Management
Water	Wat-1	Avoiding Water Use
	Wat-2	Appropriate Use of Water Sources

6.3.2 P48 Specification for resource efficiency for infrastructure delivery

The consultant or contractor prepares and submits to the principal the required REWMP. The REWMP outlines the actions that will be taken to reduce energy and greenhouse gas emissions, increase uptake of recycled and alternative materials, reduce use of virgin and high carbon intensity materials, reduce water consumption and reduce waste. This may be incorporated into a broader environmental management plan for a project or the sustainability management plan in the case of large-scale infrastructure projects undertaking ISC certification.

All projects with capital value greater than $15 million shall also set targets for resource efficiency in accordance with the P48 specification and this guideline.

Detailed requirements for each tier are included in the P48 specification.

6.4 Construction

During construction, contractors measure and report on resource efficiency data and targets established in the REWMP. This includes reporting on energy use, material use, carbon footprint, water consumption and waste (where the project is of 12 months duration or longer).

Key to this phase of implementation is the development of a construction waste management plan (usually developed by the contractor), which identifies sources of potential waste and outlets for resource recovery throughout the construction process. As part of the REWMP template, an outline of the requirements for a construction waste management plan is included, noting this will often include elements that will be completed by an external contractor and inserted into the REWMP as required.

Where contractors prepare a separate construction waste management plan, this should then be referenced in the REWMP and progress and project completion reporting.

6.5 Maintenance

State highway maintenance work is almost exclusively delivered by contractor/consultant alliances under the Waka Kotahi network outcomes contract (NOC) model.

The Resource Efficiency Policy requires new maintenance contracts to, as a minimum:

- Develop a REWMP to identify and implement resource efficiency opportunities.
- Submit at least one resource efficiency initiative for assessment within their environmental KPIs.
- Report on energy use, material use, carbon footprint, water consumption and waste management/reduction at least annually.

Requirements for resource efficiency and waste management are also included in the key results areas (KRA) and KPIs to be measured to evaluate the overall performance of Waka Kotahi contractors. These are updated annually.

Waka Kotahi has developed the Resource Efficiency Reporting Tool (appendix B) to support reporting of carbon emissions, waste and water use associated with maintenance works, with recommendations that monthly data be recorded by network maintenance suppliers. We have also produced the Resource efficiency and waste minimisation boundary reporting guide, covering the eight emissions group reporting categories.

6.5.1 Maintenance contract KPIs

The KRA Performance Framework sets out the resource efficiency KPI for maintenance contracts as: KPI measure 3.1.7 Resource Efficiency and Waste Minimisation. Note: all maintenance contracts submit at least one resource efficiency initiative for assessment.

Definition of KPI measure 3.1.7: This KPI measures resource efficiency and waste minimisation through the parties':

- implementation of resource efficiency initiatives that:
    - meet the principal's environmental plan objectives
    - align with Resource Efficiency Policy and guideline
    - are over and above meeting legal compliance
- ability to provide data to complete a basic carbon footprint:
    - reporting boundaries enable contractors to establish reporting using available data, recognising that not all resource usage is currently measured or measurable. The term 'reporting boundaries' refers to a detailed explanation of:
        - what is included and what is not included in the reporting and why
        - use of estimation techniques
        - any assumptions.

Note: There are currently no resource efficiency targets set as part of the KPI.

All resource efficiency initiatives should consider relevant policy guidance including:

- Toitū te Taiao
- Broader outcomes procurement strategy
- Environmental and Social Responsibility Policy.

For more detail please see the network outcomes contract KRA Performance Framework guidelines, with particular regard to the section 'KRA 3: Sustainability' for more details.

7 Target setting and carbon estimation

7.1 Overview

The purpose of setting targets is to track performance on resource efficiency. Setting resource efficiency targets is mandatory for tier 1 projects only in P48; however, tier 2 and tier 3 projects can consider setting targets, as it will improve visibility of resource efficiency outcomes.

Targets should be aligned with opportunities identified as part of the REWMP development process, this should lead to targets being set where the resource efficiency outcome is both material and measurable.

Targets should be set for at least one of the following categories, in order of priority:

1. Reduce whole-of-life emissions.
2. Reduced use of virgin and/or high carbon intensity materials.
3. Reduced energy consumption and associated greenhouse gases (from construction and operational phases of the asset).
4. Increased uptake of recycled and alternative materials.
5. Reduced waste.
6. Reduced water consumption.

Carbon reduction targets should be considered during business case development and confirmed during detailed design. This will depend on the project's availability of data to complete a carbon estimation. Findings from the carbon estimate can then feed into the opportunity evaluation process and REWMP. Subsequent regular reporting to Waka Kotahi will also be able to reference progress against targets relevant to the base case (see section 7.2).

Targets should be ambitious but achievable and reflect the life of the asset. They should align with low-carbon infrastructure objectives, so that project teams are challenged to consider all potential opportunities for resource efficiency. The project team should provide the reasoning behind the selection and setting of the target(s) and include this in the REWMP.

Table 7-1: Example REWMP targets

Resource efficiency category	Target example
Greenhouse gas (GHG) emissions	>10% reduction in whole-of-life emissions from base case
Virgin and high-carbon-intensity materials	>10% reduction in embodied carbon across core structural materials used
Energy	>20% reduction in energy use across construction and operational phases
Recycled and alternative materials	>10% use of materials with recycled content
Waste	>50% diversion of inert and non-hazardous waste to landfill

7.2 Carbon estimation approach

For Waka Kotahi infrastructure and improvement projects, a carbon estimation tool should be considered while developing the business case. To ensure consistency, we recommend using PEET to establish basic or detailed carbon estimates during business case development. Following on from the business case phases, projects completing ISC certification will utilise the IS Materials Calculator.

All projects should report on carbon annually and at project close-out.

7.3 Establishing a base case

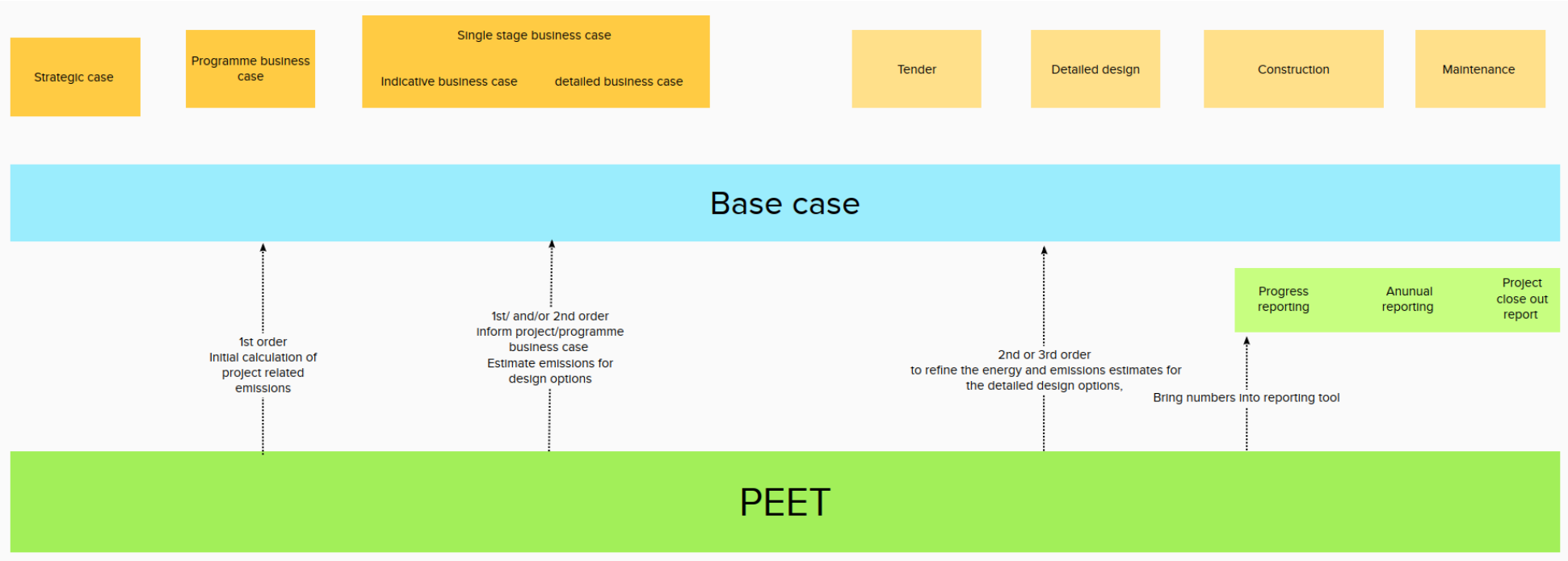


Figure 7-1: Establishing a base case

Where targets are being set, a base case needs to be established. Performance tracking is achieved by gathering 'actual' data provided during construction and comparing it to the base case. This is completed through annual reporting of actuals to Waka Kotahi.

The Waka Kotahi *Guide to calculating a base case carbon footprint for land transport infrastructure projects* sets out how develop a base case. There is also well-developed industry guidance, including:

- PAS 2080 (the 'Brief', 'Concept' and 'Design' sections)
- ISC *Design and as-built rating technical manual* (and *Operational technical manual for tier 1 maintenance projects*).

When setting a base case 'bottom-up' methodologies should be followed. This may include gathering data from a project's quantity surveyors, such as a bill of quantities. Assumptions and proxies may be used where data is limited or unavailable.

Projects setting targets submit their base case (detailed or basic carbon estimate) to Waka Kotahi along with the following information:

- Chosen base case design and justification – ISC defines a base case as a 'suitable early design accepted by key stakeholders as representative of the original concept for the infrastructure development'.
- A list of business-as-usual assumptions. For example, a business-as-usual assumption could include use of 40MP concrete. If a project then uses fly ash as a cement replacement this can be measured as a reduction.

7.4 Target setting requirements

7.4.1 Tier 1 requirements

In accordance with the Resource Efficiency Policy and the P48 specification, for all infrastructure improvement projects with a capital value greater than $15 million, the project team sets targets for resource efficiency. When setting targets, tier 1 projects set a base case from which performance can be tracked.

Tier 1 projects provide relevant data to complete a **detailed carbon estimate.** This estimate can be used as the base case when setting carbon reduction targets.

7.4.2 Tier 2 requirements

The Resource Efficiency Policy and the P48 specification does not require tier 2 projects to set targets. However, where a project base case can be established, target setting is encouraged.

Tier 2 projects provide relevant data to complete a **basic carbon footprint**. If a tier 2 project wishes to set a carbon reduction target, the basic carbon footprint can be used as the base case. This data can be taken from a bill of quantities for design materials and/or estimated where data is not available.

7.4.3 Tier 3 requirements

The Resource Efficiency Policy and the P48 specification does not require tier 3 projects to set targets.

7.4.4 Maintenance contract requirements

The Resource Efficiency Policy does not require maintenance contracts to set targets.

There are opportunities for maintenance contracts to set targets. For example, targets are required for contracts pursuing an IS Operational Rating.

7.5 Carbon estimation

The following guidance is provided to support consistency in carbon estimations:

- Design life needs to be clearly defined for the asset and key structures/pavement. A whole-of-life approach should be taken when evaluating the design life of an asset, including end-of-life replacement, decommissioning and deconstructing.
- The project boundary should be clearly stated as it relates to the quantities being provided (that is, clarity on the scope of the project and what is and is not included).
- Material quantity estimates should be taken from the design for permanent works and not include temporary works.
- Major operational phase materials replacement, electricity/energy and use of fixed assets should be estimated for useful forecast life of asset.
- Construction fuel and electricity use should be estimated where data is not available during early design phases.

Table 7-2: Carbon estimate approach

Project type	Estimate type	Definition
Tier 1	Detailed carbon estimate	Carbon estimate for the project should cover 90% of total project footprint. Estimates for the distance of transport of materials from point of manufacture to site should be included.
Tier 2	Basic carbon estimate	Carbon estimates for the project should cover core materials. This should cover 70–80% of total project footprint.

8 Preparing a resource efficiency waste minimisation plan (REWMP)

Tools/useful links:

- ✓ Opportunities register (appendix A)
- ✓ REWMP template (appendix C)

8.1 Overview

All Waka Kotahi infrastructure improvement projects and maintenance contracts develop a resource efficiency waste minimisation plan (REWMP). The specific requirements for the REWMP are determined by the scale and type of project, with some large infrastructure projects likely to be following the IS Rating Scheme and associated reporting.

A REWMP is developed to identify and implement opportunities to reduce energy and greenhouse gas emissions, increase uptake of recycled and alternative materials, reduce use of virgin and high carbon intensity materials, reduce water consumption and reduce waste to landfill.

The main sections of a REWMP will be consistent across infrastructure improvement projects and maintenance contracts of various sizes.

The main sections of a REWMP are:

1. project information
2. resource efficiency initiatives
3. construction site waste management plan (if applicable)
4. data tracking and reporting.

The level of detail and complexity of the REWMP will vary depending on the tier and phase of the project. See Figure 8-1: REWMP project requirements for guidance by tier. If appropriate, REWMP aspects may be incorporated into, or be a sub-plan to, a broader environmental management plan or IS sustainability management plan for the project.

8.2 Approach

Tier 1 and 2 projects: The REWMP will be prepared by a suitably qualified professional, as defined in *P48 Specification for resource efficiency policy for infrastructure delivery and maintenance*.

Tier 3 projects: A tier 3 REWMP will be prepared in accordance with the P48 specification, however, it does not necessarily require preparation by a suitably qualified professional.

IS projects: The REWMP will be developed as part of IS project deliverables. While all Waka Kotahi infrastructure and maintenance projects are required to meet the P48 specification, it is acknowledged that IS projects will instead report key resource efficiency achievements as part of the requirements under the IS Rating Scheme, as the intention is not to duplicate work, noting that for IS projects the REWMP is to align with the requirements of IS v2.1, particularly credits Lea-1 and Rso-1. Where changes to the content required by ISC occurs, for example through updates to the technical manual or rulings, the ISC requirements will take precedence.

8.3 REWMP requirements

Waka Kotahi have developed a REWMP template to support consistency in resource efficiency planning, (see appendix C). In accordance with the P48 specification, the contractor prepares a REWMP that includes the following:

- project description, including timelines and targeted sustainability goals
- map of project boundaries
- the overarching strategy and programme for incorporating resource efficiency outcomes throughout the project

- identified opportunities and actions for resource efficiency and waste reduction for the foreseeable life of the asset
- description of roles, responsibilities and accountabilities for documentation and submittals, including:
    - identify the overall sustainability lead and point of contact o Identify champions for the selected outcomes
    - risk analysis plan for the implementation of the REWMP
    - outline how this plan interfaces with other environmental plans prepared for the project, including ISC implementation plan (where relevant)
    - process outlining the tracking and reporting of progress on resource efficiency measures to the principal and Waka Kotahi resource efficiency lead on an annual basis.

The core requirements for a REWMP are consistent across the three project or maintenance contract tiers, with additional requirements for tier 1 and 2 projects as described in Figure 8-1.

Figure 8-1: REWMP project requirements

REWMP contents	Tier 1–3 core requirements	Tier 2 requirements (additional)	Tier 1 requirements (additional)
Project information	Project overview and completion date. Identify point of contact for resource efficiency reporting (if project duration >12 months). Statement on annual REWMP review (if project duration >12 months).	Statement on purpose of REWMP. Identify point of contact for resource efficiency reporting. Outline of interfaces with other environmental plans prepared for the project.	Map of project boundaries. Resource efficiency target (see section 7.1) and any other sustainability goals. Description of roles, responsibilities and accountabilities for documentation and submittals, including the overall sustainability lead and point of contact.
Resource efficiency initiatives	Summary of project initiatives (as identified in section 4.2) including anticipated benefits. Brief initiative implementation plan, eg responsible person, timeframes, key tasks, success measures (qualitative or quantitative). Identify potential risks and barriers to achieving the initiatives and how the project plans to overcome them.	None.	The overarching strategy for incorporating resource efficiency outcomes through the duration of the project.
Construction site waste management plan	Planning for site waste management is usually undertaken by constructors rather than design teams. If applicable to the project, then the following should be included: • responsibilities for waste management system set up and duty of care tracking/docket control • waste contractor details • table showing estimated waste quantities of main project waste streams and their intended end destination for reuse, recycling, recovery, cleanfilling or landfilling.		
Data tracking and reporting (if project duration is >12 months)	State required resource data to be tracked in accordance with *P48 Specification for resource efficiency policy for infrastructure delivery and maintenance*. See specific data reporting requirements in section 5. State frequency of any reporting agreed with Waka Kotahi (minimum annually).	State requirement to complete a basic carbon footprint.	State requirement to complete a detailed carbon footprint (as defined in section 5). The contractor is to prepare at least one case study of a resource efficiency initiative achieved on the project that can be published on the Waka Kotahi website.
Project close-out reporting (if project duration is <12 months)	State that a project close-out report will be submitted to Waka Kotahi.		

9 Reporting on resource efficiency

Tools/useful links:

- ✓ REWMP template (appendix C)
- ✓ Waka Kotahi Resource Efficiency Reporting Tool (appendix B)

9.1 Overview

Reporting carbon footprint data to Waka Kotahi is to allow data to be used to support and enable behaviour change across capital improvement projects and maintenance contracts. By having data at a portfolio level, Waka Kotahi can make more informed decisions regarding emissions reduction opportunities and progress. It will also enable Waka Kotahi to report on material scope 3 emissions as part of the Carbon Neutral Government Programme (CNGP) requirements.

9.2 Project reporting requirements

Waka Kotahi requires at least **annual** progress reporting on resource efficiency for **all** projects (tier 1–3).

In accordance with P48 specification, the contractor documents resource and materials use for the duration of the contract and submits an annual summary with a monthly breakdown to the principal and via email to environment@nzta.govt.nz.

To support project reporting, Waka Kotahi have developed a Resource Efficiency Reporting Tool and provide reporting templates for progress and project close-out reporting – noting that for tier 2–3 projects that are completed within 12 months, this can be a combined report.

The Waka Kotahi Resource Efficiency Reporting Tool and project reporting templates are included in appendices D–F.

9.2.1 Resource Efficiency Reporting Tool

To support consistent reporting, Waka Kotahi has developed a resource efficiency and waste minimisation data collection template (see appendix B: Resource Efficiency Reporting Tool).

The reporting tool is currently in the format of an Excel workbook. It is intended to be used by improvement projects and network maintenance contracts to report on the usage of various carbon emission categories within their design/operating network. The data will be used by Waka Kotahi to estimate greenhouse gas (GHG) emissions from infrastructure delivery and maintenance activities reported through the Waka Kotahi annual report.

A detailed readme within the spreadsheet provides an introduction and summary along with guidance on input fields including a breakdown by emissions group.

9.2.2 Reporting during options development

As part of preparing the project REWMP, it will be necessary to consider the carbon estimate and resource efficiency opportunities. Project reporting should include this initial carbon estimate and track resource efficiency opportunities and implementation throughout the project lifecycle.

9.2.3 Reporting during construction

During the construction phase, actual data on resource use must be gathered and reported to Waka Kotahi, using the Resource Efficiency Reporting Tool.

Table 9-1 provides a high-level summary of the reporting categories by project tier. Noting that reporting requirements should compare actuals (where possible) against initial carbon estimates to measure impact of the REWMP implementation.

Table 9-1: Reporting guidance by project tier

Tier 1* >$15m, >12 months	Tier 2 $2m–$15m, or >$15m and <12 months	Tier 3** <$2m
• Energy on site - liquid fuel - gas fuel - electricity. • Transport off-site - diesel - biodiesel - unleaded petrol. • Water - potable - non-potable. • Waste - cleanfill - managed fill - landfill - reused/recycled. • Materials - concrete - steel - inert hardfill reused (arising in situ or imported to project). • Road surface - aggregates in pavement - bitumen - recycled asphalt pavement (RAP).	• Energy on site - liquid fuel - gas fuel. • Water - potable. • Waste - landfill. • Materials - concrete - steel - inert hardfill reused (arising in situ or imported to project). • Road surface - aggregates in pavement - bitumen - recycled asphalt pavement (RAP).	• Energy on site - liquid fuel. • Waste - landfill • Materials - concrete - steel - inert hardfill reused (arising in situ or imported to project). • Road surface - aggregates in pavement - bitumen - recycled asphalt pavement (RAP).

Note: These project reporting categories are indicative and will be updated through the Resource Efficiency Reporting Tool.

*Tier 1 projects, which follow the IS Rating Scheme, will have separate reporting requirements; however, the data will still need to be reported in accordance with the tier 1 reporting frequency.

*For tier 3 projects where data is not readily available, estimates or proxy data is acceptable.

9.2.4 IS project reporting requirements

If a project is required to complete ISC certification then reporting will follow the requirements for embodied carbon (materials), energy, water and waste in accordance with *P49 Sustainability rating scheme specification*.

IS projects should ensure that sustainability progress reporting required for the IS rating aligns with the annual resource efficiency progress report.

9.3 REWMP progress reporting

Progress reporting by projects and maintenance contracts will be provided to Waka Kotahi on implementation of the REWMP, progress on initiatives, additional opportunities, risks and challenges.

The frequency of progress reporting will be agreed with Waka Kotahi and will occur, at a minimum, annually. Significant project milestones and other project reporting requirements should be taken into consideration when determining the most appropriate frequency and timing of REWMP progress reporting.

REWMP progress reporting will be prepared by a suitably qualified professional for all tier 1 and 2 projects, while tier 3 project reports can be completed by the project team. A resource efficiency progress reporting template is provided in appendix D.

9.4 Close-out report

A project close-out report is prepared on any tier 2 or tier 3 projects that are less than 12 months in duration. A project close-out report template is provided in appendix E.

9.5 Maintenance contract reporting requirements

Maintenance contracts report data in accordance with the Resource Efficiency Waste Management KPI and this guideline. Reporting is completed quarterly, with monthly data recorded.

Waka Kotahi reporting requirements for Maintenance contracts are described in the Waka Kotahi Network Outcomes Contract: KRA Performance Framework guideline. All maintenance contracts include at least one resource efficiency initiative as part of their Sustainability KRA. The resource efficiency KPI included in the KRA for maintenance contracts is: KPI Measure 3.1.7.

All new contracts are required to report on resource efficiency in accordance with the Resource Efficiency Policy and this guideline.

9.6 Case studies

All tier 1 and tier 2 infrastructure improvement projects and all maintenance projects are required to prepare at least one resource efficiency case study for publication on the Waka Kotahi website. A case study template is provided in appendix F.

Appendices

All appendices are separate documents that can be downloaded from the Resource efficiency guideline for infrastructure delivery and maintenance page on the Waka Kotahi website.

Appendix A: Opportunities register

The opportunities register is a Microsoft Excel-based tool.

Appendix B: Resource Efficiency Reporting Tool

The reporting tool is a Microsoft Excel-based tool. The accompanying *Guide to using the Resource Efficiency Reporting Tool* provides information on how to use the tool.

Appendix C: Resource efficiency and waste minimisation plan report template

A Microsoft Word template to help you complete your resource efficiency and waste minimisation plan (REWMP) report.

Appendix D: Resource efficiency and waste minimisation plan progress report template

A Microsoft Word template to help you complete your REWMP progress report.

Appendix E: Resource efficiency close-out report template

A Microsoft Word template to help you complete your close-out report.

Appendix F: Resource efficiency case study template

A Microsoft Word template for completing a case study from your project.