*Category 1*

# Connectivity Infrastructure

## *What Type of Infrastructure Does This Include*

**Fixed Broadband (NBN and Fibre)**
high-bandwidth, low-latency, always-on wired connection; the backbone for fixed-site data exchange.

**Mobile Networks (4G and 5G)**
wireless connectivity for mobile assets, remote sensors, and field workers; 5G adds low latency and device density for real-time control.

**LPWAN, Including LoRa**
ultra-low-power, long-range, low-data-rate connectivity for distributed sensors across large geographic areas.

**Subsea and Terrestrial Fibre Cables**
very-high-capacity backbone for international and interstate data exchange; critical for cloud and AI workloads.

## *Key attributes*

The transmission layer that moves data between assets, people, and systems. The other four categories rely on it to transmit data between assets, people and systems.

Located on fixed and movable objects, across urban and rural settings, supporting most critical infrastructure sectors and general municipal infrastructure.

Ranges from the passive and long-lived (cable corridors, conduit, fibre, towers), with service life typically measured in decades, to the active and shorter-lived (radio access equipment, exchange and headend hardware), refreshed on a much shorter cycle.

Its environmental impacts come mostly from the passive works, such as trenching, marine cable laying and land corridors. Its social and economic impacts come from coverage: where coverage is thin, communities miss out on services and opportunities, which deepens existing disadvantage.

## *The Landscape: Investment, Legislation, and Trends*

The NBN now reaches almost all Australian premises through fixed-line, fixed wireless and satellite technologies[8], with 4G mature and 5G rollout underway across metropolitan areas.

In Aotearoa New Zealand, the Ultra-Fast Broadband programme was completed in 2022, giving around 87 per cent of New Zealanders access to fibre[9]. Rural connectivity programmes continue to extend mobile and wireless coverage.

Subsea and terrestrial cable investment is ongoing and carries a sovereign risk dimension identified in national security settings. New cable builds carry high embodied carbon and marine impacts that sit outside most current reporting.

The Security of Critical Infrastructure Act 2018 covers communications. A regional connectivity agenda continues to grow as a policy focus, driven by social equity and economic participation.

*References: Security of Critical Infrastructure Act 2018; NBN Co coverage reporting; regional and remote connectivity programs.; Ministry of Business, Innovation and Employment (Ultra-Fast Broadband programme)*

**DUAL LENS: OPPORTUNITY AND FOOTPRINT**

## *Sustainability Benefits of Digital Infrastructure*

**Remote and distributed workforce:** reliable connectivity lets field teams operate assets and supervise plant from a distance, cutting vehicle trips and commuter emissions.

**Smart metering and demand management:** always-on networks carry the meter and control data that let energy and water utilities move demand away from peak periods and reduce peak loads, rather than build new peak capacity.

**Monitoring at scale:** the low cost and 5-to-10-year battery life of LPWAN make it viable to monitor remote catchments, farms, and assets where the cost of hard-wired monitoring could not be justified.

**Distributed data infrastructure:** high-capacity fibre lets compute and storage sit closer to where they are needed, helping to reduce the energy impact of centralising infrastructure.

**Regional inclusion:** reliable coverage supports health, education, employment and civic participation to regional, remote and First Nations communities, and lets local workers support communities without relocating.

**Productivity in the regions:** connected assets and remote operations lower the cost of serving dispersed populations and support new service models, from telehealth and small e-commerce businesses to precision agriculture and mining.

## *Digital Infrastructure Issues to Watch*

01 **Active equipment energy consumption**
exchanges, headends, and tower electronics draw continuous power, and radio hardware refresh cycles generate a recurring e-waste stream.

02 **Copper legacy e-waste**
decommissioning copper network infrastructure as it is replaced by fiber creates a large one-off material stream that needs reuse and recycling pathways.

03 **Passive works carbon and marine impact**
embodied carbon in cable manufacture and installation, seabed disturbance during marine laying, and the labour and sourcing practices of cable and tower suppliers, are concentrated in the build phase.

04 **Ownership concentration**
a small number of mobile network operators and mobile network infrastructure providers control the network and supporting infrastructure, so they also hold much of the sustainability data and have significant influence over procurement and reporting.

05 **Siting and engagement**
tower sites and cable routes may affect communities and Country, so engagement and cultural heritage processes need to start early rather than be treated as late approval risks.

06 **The cost of the last mile**
remote coverage often depends on subsidy (eg. Mobile Black Spot Program) and shared infrastructure between mobile network operators. Where that falls short, coverage gaps can become significant gaps in economic participation and service delivery.

## *The Key Questions*

Considerations that might help a member organisation build a business case for action and investment and to govern well are included in the table below.

**P — PROCESS**
*Have we embedded embodied carbon, responsible sourcing and end-of-life criteria into passive infrastructure (the long-lived physical elements such as ducts, conduit, cables and towers, as distinct from active electronic equipment) procurement?*

**O — ORGANISATION AND CULTURE**
*Who inside our organisation holds the relationship with connectivity network stakeholders, and who is accountable for connectivity sustainability data?*

**T — TECHNOLOGY**
*Are we specifying open standards and oversized passive elements such as conduit and power feeds, so upgrades do not require civil rework?*

**I — INFORMATION**
*Have we set expectations for disclosure of energy and e-waste data to support our Scope 3 reporting?*

## *Applying This Across the Asset Lifecycle*

Below are five common questions you may face across the asset lifecycle, each from the perspective most likely to raise it.

Connectivity is the enabler layer. Across the lifecycle, the task is to surface a footprint that is sometimes considered low impact, while making the enabling case without overstating it.

### Planning

*State authority asset owner*

*"We are planning a regional connectivity program. How do we build sustainability into the business case when connectivity is assumed to be invisible?"*

Present the case in two parts. As an enabler, quantify what the network unlocks, such as remote operations, smart metering, and environmental monitoring at scale. As part of footprint accountability, require network operators and delivery partners to disclose energy and e-waste data up front, making this information visible from the outset. Consider closing remote and regional gaps as a social equity outcome.

### Design

*Sustainability consultant*

*"I am advising on the design of new cable corridors and conduit. What sustainability specifications should I recommend?"*

Specify oversized passive elements such as conduit and power feeds, and open standards, so future upgrades don't require civil rework. Separate the long-lived passive infrastructure from the shorter-lived active equipment so each renews on its own cycle. This modest uplift at the outset avoids stranded assets and waste over a 25-year-plus life.

### Construction

*Construction company sustainability manager*

*"We are installing subsea and terrestrial fibre. Where is the sustainability risk in the construction phase?"*

Embodied carbon in cable installation and marine impacts during laying are the main construction footprint, alongside spoil, vegetation clearing and disturbance to Country along corridors. Capture and report the embodied carbon of the works, manage marine and ground disturbance to agreed controls, and seek modern slavery and responsible sourcing assurance from cable and equipment suppliers. Record data for Scope 3 reporting.

### Operations and Maintenance

*Asset owner and operator*

*"We operate assets that depend on digital networks. How do we account for connectivity we do not own?"*

Clarify internally who holds the relationship with network owners and operators and who is accountable for connectivity sustainability data. Then make energy and e-waste disclosure a standing contract expectation, not a one-off request. Ownership is concentrated in a few operators, so a contract condition is the practical lever for Scope 3 reporting.

### End of Life and Renewal

*Asset owner and operator*

*"We are retiring copper as we move to fibre. What is the sustainability exposure at end of life?"*

The copper-to-fibre transition creates a large e-waste stream that can be overlooked. Plan the retirement with reuse and recycling pathways rather than default disposal, and record the volumes. Align active equipment refresh with the passive asset's longer life so you replace no more than you need to.

## *The Cost of Inaction: Gaps in the Current Landscape*

**Wrongly assumed to be low impact**
because connectivity can be overlooked as physical infrastructure, the embodied carbon of passive works and the e-waste of network transitions go unmeasured, so the footprint grows without appearing in any report or decision.

**A widening regional divide**
as services move online and assets become connectivity-dependent, coverage gaps in remote and regional areas can translate directly into social and economic exclusion.

**Lock-in of passive assets**
cable corridors and conduit laid now set outcomes for decades, so a decision made without sustainability criteria may lock in lower performance for the life of the asset.