2024

DIGITAL INFRASTRUCTURE STUDY

LAKE MACQUARIE NSW

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FUNDING & GRANTS COLLECTIVE

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Foreword

The average household today has around 20 connected devices, ranging from smartphones, iPads and laptops to smart home appliances like fridges, air conditioning, lighting and security cameras. Our reliance on digital connectivity has skyrocketed, transforming everything from the way we work and communicate to how we manage daily tasks like shopping and accessing entertainment. In this digitally driven era, fast and reliable Internet is no longer a luxury—it's a necessity.

This report titled *Digital Infrastructure Study Lake Macquarie NSW* provides a desktop assessment of the current digital infrastructure of Lake Macquarie, New South Wales, to evaluate the availability, performance, and coverage of digital services in the area, identify gaps, and make recommendations for improvement.

With digital infrastructure playing a key role in supporting economic growth, social inclusion, and quality of life, it is crucial to ensure it meets the growing needs of residents and businesses in this rapidly evolving landscape. This assessment examines the region's broadband internet, mobile networks, public Wi-Fi, data centres, digital literacy programs, and smart city technologies, identifying gaps and providing actionable recommendations for improvement.

As Lake Macquarie grows—both in population and as a regional economic hub—its ability to provide strong, reliable digital infrastructure will directly impact the community's ability to thrive. This report aims to highlight areas where improvements can be made to ensure Lake Macquarie remains digitally competitive and ready for the future.

Key objectives

1. Assess current digital infrastructure: We will evaluate the availability, speed, and reliability of broadband internet, mobile networks, and public Wi-Fi services across the region.
2. Identify gaps and improvement areas: Any deficiencies in digital connectivity and services will be highlighted, focusing on areas requiring urgent attention and improvement.
3. Provide actionable recommendations: Based on the findings, we will outline strategies to enhance digital infrastructure and support future growth, ensuring Lake Macquarie remains digitally competitive.

The study covers the entire Lake Macquarie region and focuses on the following types of infrastructure:

- *Broadband internet*: We will assess the quality, speed, and distribution of broadband services, referencing data from public resources such as NBN Co's fibre rollout and business fibre zone maps. The NBN Co is rolling out multi-gigabit speeds, with improvements expected by September 2025, which will be considered in the recommendations.
- *Mobile networks*: Evaluating the coverage and performance of mobile networks (3G, 4G, and 5G) with data from Telstra and Optus coverage maps. Special attention will be given to areas with limited or poor coverage.
- *Public Wi-Fi*: A thorough inventory of public Wi-Fi hotspots will be conducted to assess their accessibility and reliability.
- *Data centres*: We will explore available local data centres, assessing their capacity and performance to determine whether they meet current and future demand.
- *Digital literacy programs*: We will review the availability and effectiveness of programs aimed at improving digital skills in the community. These programs are vital to ensuring that the community can fully leverage the infrastructure improvements.
- *Smart city technologies*: Existing smart city technologies will be inventoried, and their integration and effectiveness in enhancing city services, such as public transport, energy management, and public safety, will be assessed.

Executive Summary

With a rapidly growing population and economy, Lake Macquarie's digital connectivity will play a crucial role in sustaining future growth, supporting local businesses, and improving the quality of life for residents.

A diversified and resilient digital infrastructure will support Lake Macquarie's future growth. High-speed Internet is no longer a luxury but necessary for economic growth, social inclusion, and overall quality of life. By prioritising fibre upgrades and promoting alternative connectivity solutions in underserved areas, Lake Macquarie can future-proof its digital infrastructure and ensure its residents and businesses remain connected, competitive, and ready for the future.

Lake Macquarie's population is expected to grow by 39,000 people by 2041 and the need for 12,000 new dwellings, expanding mobile network coverage, particularly in areas slated for new development, is essential. It is also essential to educate the community on the importance of diversifying their connectivity options and ensure that residents are better prepared. This will reduce the likelihood of communication failures in critical moments and strengthen the region's digital ecosystem, making it more adaptable to growth and unforeseen disruptions.

Expanding public Wi-Fi access is critical to closing the digital divide in Lake Macquarie, especially for lower-income and outer urban communities. Public Wi-Fi reduces financial pressures on disadvantaged households and supports digital literacy, social inclusion, and economic growth. Lake Macquarie can ensure that all its residents have equal access to the digital world, ensuring no one is left behind.

Establishing and expanding local data centres in Lake Macquarie would position the region as a key player in the digital economy. By attracting tech-driven businesses and startups, local data centres can create job opportunities and support the growth of emerging industries.

It also aligns with Australia's broader strategy to build a more resilient and self-sufficient digital infrastructure, in addition to enhancing data sovereignty, and bolstering national security. Investing in sovereign data centres will not only improve data accessibility and speed but also position Lake Macquarie as a hub for digital innovation and economic growth.

As faster broadband and 5G mobile networks become more widely available, improving digital literacy will be essential for ensuring that residents of Lake Macquarie can fully participate in the digital economy and access basic services.

Lake Macquarie has begun investing in smart city technologies, integrating the Internet of Things (IoT) solution to enhance urban services, improve sustainability, and promote a better quality of life for its residents. Lake Macquarie's smart city initiatives represent a solid foundation for expanding IoT-powered solutions across the region and will attract high-tech industries and ensure the city remains competitive and prepared for future growth.

Lake Macquarie is well-positioned to become a leader in smart city technologies and digital transformation. By targeting advocacy and funding efforts in areas such as broadband expansion, data centre development, smart city scaling, and digital literacy, the region can address its infrastructure gaps while unlocking opportunities for economic growth and improved urban services. Collaborative efforts, including co-contribution projects and technology trials with private sector partners, will further accelerate Lake Macquarie's smart city ambitions and ensure a more sustainable, connected, and inclusive future.

Key findings

1. *Broadband internet*: While urban areas enjoy good broadband access, outer urban regions face significant gaps, with slower speeds and reliance on outdated infrastructure. The NBN fibre rollout continues, but gaps remain in areas like Wyee, Cooranbong, and Morisset, where outdated Fibre to the Node (FTTN) and fixed wireless systems reduce service quality.
2. *Mobile networks:* Coverage in urban hubs is strong, with good 4G and 5G availability. However, outer urban and coastal areas experience inconsistent signals, with connectivity challenges in hilly or remote parts. Mobile providers are encouraged to invest in expanding 5G services to high-growth areas, prioritising regions where development is expected to accelerate.
3. *Public Wi-Fi*: Limited to commercial and community hubs in urban centres, public Wi-Fi coverage does not reach outer urban communities, creating digital divides that impact lower-income and geographically isolated residents who may depend on free Wi-Fi for access to essential online services.
4. *Data centres*: Lake Macquarie lacks local data centres, with businesses relying on facilities in Newcastle and Sydney. This increases latency and limits local access to high-speed data processing, creating barriers for industries like healthcare, advanced manufacturing, and education that require reliable, fast access to large datasets.
5. *Digital literacy programs*: Existing digital literacy programs are unevenly distributed across the region, with outer urban and older residents experiencing the most significant gaps. As digital infrastructure improves, targeted efforts are needed to ensure all residents can fully utilise online services, particularly for essential services such as telehealth and government services.
6. *Smart city technologies*: Lake Macquarie has invested in smart lighting and traffic management systems and is trialling sensor-equipped bins in Warners Bay. However, there is potential for further development, especially in the region's public safety systems, environmental monitoring, and smart waste management.

Key Recommendations

This report outlines a number of key recommendations to ensure Lake Macquarie's ongoing investment in digital infrastructure and targeted advocacy and funding efforts, will enable the region to support its growing population, foster economic development, and remain resilient in a digitally evolving world. Collaborative partnerships, co-contribution projects, and expanding smart city technologies will accelerate Lake Macquarie's digital transformation, ensuring an inclusive, connected, and competitive future.

- [ ] **Prioritise fibre broadband upgrades in underserved areas**

  Advocate for NBN Co to accelerate fibre-to-the-premises (FTTP) upgrades in Wyee, Cooranbong, Rathmines, and other outer urban areas. Expanding access to high-speed fibre broadband will support Lake Macquarie's projected population growth and attract tech-driven industries.

- [ ] **Expand mobile network coverage and strengthen emergency resilience**

  Collaborate with Telstra, Optus, and Vodafone to improve coverage of 4G and 5G in underserved outer urban and coastal areas. Lake Macquarie should also explore technology trials, such as low-earth orbit (LEO) satellite services, to enhance coverage and ensure connectivity resilience during emergencies.

- [ ] **Invest in local data centres for improved latency and data sovereignty**

  Attract investment for local data centres to reduce reliance on facilities in Newcastle and Sydney. Local centres will benefit industries requiring rapid data access, reduce latency, and enhance data sovereignty, keeping sensitive data within Australia's jurisdiction.

- [ ] **Enhance public Wi-Fi in key community hubs**

  Expand public Wi-Fi in outer urban and low-income areas to support equitable access to online services. Consider partnerships with Telstra Air and local businesses to establish hotspots in community hubs, parks, and libraries.

- [ ] **Boost digital literacy through targeted programs**

  Develop digital literacy programs specifically for older residents and low-income households, who score lower on digital inclusion indices. Programs can be delivered through Seniors Week Expos hosted by local MPs focusing on cybersecurity, telehealth, and essential online services.

- [ ] **Expand smart city and IoT initiatives**

  Scale smart waste management, public safety, and environmental monitoring citywide. Use Lake Macquarie's Smart Cities Council membership to collaborate with global cities for knowledge exchange and investment opportunities. IoT technology trials with companies like Cisco or Siemens can improve urban management, resource efficiency, and safety.

- [ ] **Engage in co-contribution and technology trial partnerships**

  Explore co-contribution projects with mobile network providers, data centre operators, and IoT manufacturers. Participating in technology trials can position Lake Macquarie as a regional leader in digital innovation while sharing investment costs with private sector partners.

Recommendation Snapshot

Digital Infrastructure	1. Prioritise fibre upgrades in underserved areas 2. Deploy fixed wireless and satellite solutions for remote areas 3. Establish public Wi-Fi hotspots in gap areas 4. Advocate for faster rollout of NBN Co's multi-gigabit services 5. Monitor and address performance gaps regularly
Lake Macquarie Current assessment	1. Improve mobile coverage in growth areas 2. Ensure seamless mobile tower-to-satellite handover 3. Strengthen infrastructure for peak periods and population influx 4. Expand 5G networks to support future growth 5. Integrate satellite technology into emergency response plans 6. Encourage public Wi-Fi and 5G hotspots in key areas 7. Monitor and enhance network resilience
Lake Macquarie - Expanding public Wi-Fi access	1. Target underserved areas 2. Leverage Telstra Air Networks 3. Support for local businesses 4. Focus on community hubs
Data Centres	1. Encourage public-private partnerships 2. Create a digital innovation hub 3. Cybersecurity and national security 4. Incentivise data centre development
Digital Literacy - Education Program	1. Expand programs in outer urban and low-income communities 2. Target older residents and disadvantaged groups 3. Partner with local businesses and NGOs 4. Integrate digital literacy in schools 5. Provide multilingual digital education
Smart City Technologies and IoT	1. Expand smart waste management citywide 2. Invest in IoT-Based public safety solutions 3. Increase environmental monitoring 4. Develop a comprehensive smart city strategy 5. Collaborate with global smart city networks

Digital Infrastructure

- **Broadband Internet**
- **Mobile Networks**
- **Satellite support**

Broadband Internet

What is broadband internet?

Broadband internet refers to high-speed, always-on internet access, which is significantly faster and more reliable than the old dial-up connections. The term "broadband" covers several types of technologies, including DSL (Digital Subscriber Line), cable, fibre optics, and satellite connections. It has become necessary for modern households and businesses, enabling us to stream videos, play online games, participate in virtual meetings, and manage smart home devices seamlessly.

The evolution of broadband internet

Broadband internet has evolved significantly over the years. Initially, most homes connected to the Internet via dial-up connections that used the copper phone network to deliver slow, often unreliable service. This technology was followed by DSL, which still used copper phone lines but at much faster speeds, and cable internet, which utilised T.V. cable infrastructure to improve speeds further.

The latest and most significant leap in broadband technology is fibre-optic Internet, which uses light signals transmitted through glass or plastic fibres, providing far greater speeds and capacity than copper-based systems. Fibre-optic broadband can support gigabit speeds (up to 1,000 Mbps or more), which are essential for bandwidth-heavy activities like 4K video streaming, cloud-based applications, and real-time video conferencing. In comparison, DSL and cable internet, which rely on older copper networks, struggle to meet these high-speed demands.

Why connecting to the fibre network is important

1. Faster speeds

Fibre-optic internet offers significantly faster speeds than traditional copper-based DSL or cable. For example, while DSL speeds range from 5 to 35 Mbps, fibre-optic Internet can provide speeds of up to 1 Gbps or more. This difference is critical as more homes and businesses require high bandwidth for multiple devices, streaming, and remote work.

2. Lower latency

Fibre networks offer lower latency (the delay in data transmission), which is essential for activities like video conferencing, online gaming, and other real-time applications. Lower latency results in smoother connections with less lag, improving the overall user experience.

3. Future-proofing

Fibre networks are scalable, meaning they can support increasing data demands in the future without needing major upgrades. As new technologies and services, such as virtual reality (VR) and augmented reality (AR), become more common, the need for high-speed, high-capacity networks will only increase. Fibre infrastructure ensures that communities are prepared for this shift.

4. Improved reliability

Unlike copper networks, fibre-optic cables are less vulnerable to **electrical interference and signal degradation over long distances. Copper wires can be susceptible to environmental factors like moisture, temperature changes, and electrical interference, which can degrade signal quality and cause outages. In contrast, fibre-optic cables are much more durable and capable of maintaining consistent performance over longer distances, making them far more reliable.

5. Supporting economic growth

For businesses, reliable fibre internet is essential for increasing productivity, facilitating remote work, and enabling innovation. Regions that invest in fibre infrastructure become more attractive to businesses, investors, and startups as they provide the high-speed connectivity needed for modern commerce. Fast, reliable Internet also supports smart city initiatives and new digital technologies, making cities like Lake Macquarie more competitive in the global economy.

The shift away from copper networks

One of the main reasons for the transition from copper-based networks to fibre is the inherent limitations of copper infrastructure. Copper wiring, originally designed for voice communication (telephone lines), has lower bandwidth and is more prone to signal degradation over longer distances. DSL services, which rely on copper lines, typically max out at 35 Mbps, and the further you are from the exchange, the slower the speeds become. Copper networks are also expensive to maintain and are increasingly unable to keep up with the demands of modern internet usage.

Additionally, copper's performance is highly susceptible to electromagnetic interference, weather conditions, and physical wear, making it less reliable than fibre. As internet demand grows, fibre is the clear solution for providing faster, more reliable, and future-proofed connectivity.

Many countries, including Australia, are phasing out their copper networks in favour of fibre. The NBN (National Broadband Network) in Australia, for example, is transitioning to fibre-to-the-premises (FTTP) or fibre-to-the-node (FTTN) in many areas, drastically improving internet speeds and reliability for businesses and households.

Connecting to the fibre network is crucial for supporting the growing demands of modern digital life. As more devices connect to the Internet and as our reliance on high-speed, reliable broadband increases, upgrading from the old copper-based infrastructure to fibre-optic networks is essential. Fibre offers faster speeds, reliability, and scalability to support Lake Macquarie's growth, innovation, and future connectivity needs. Transitioning to fibre ensures the region remains digitally competitive and well-prepared for the technological advancements of tomorrow.

Lake Macquarie's broadband infrastructure largely relies on NBN services, with rollouts for fibre connections underway. NBN Co's most recent updates highlight the region's inclusion in the upcoming multi-gigabit fibre upgrade set for completion in September 2025. However, outer urban and remote areas within the region may experience slower rollouts, creating potential gaps in coverage.

Identified gaps

While urban areas of Lake Macquarie generally enjoy good access to NBN broadband services, there are notable gaps in outer urban parts of the region. These gaps manifest in slower broadband speeds, lower quality of service, or even a complete lack of high-speed Internet in more geographically isolated communities.

In the outer urban areas of southern and western Lake Macquarie, broadband speeds are significantly lower compared to central urban areas. Suburbs such as Morisset, Wyee, Cooranbong, Wyee Point, and Rathmines have been identified as regions where NBN services are either limited or rely on older technologies like Fibre to the Node (FTTN), Hybrid Fibre Coaxial (HFC), or Fixed Wireless. These technologies do not provide the same speed and reliability as the more advanced Fibre to the Premises (FTTP), resulting in slower data transfer rates and intermittent service.

The NBN Co Fibre Rollout Map shows that fibre connectivity is still being expanded, but many outer urban regions are left dependent on outdated systems, which struggle to meet the increasing demand for high-speed Internet. The northern parts of Lake Macquarie, including Teralba, Killingworth, and Wakefield, also exhibit slower speeds as they still await an upgrade to fibre-based services.

Recommendations

- [ ] **Prioritise fibre upgrades in underserved areas:**

  Suburbs such as Morisset, Wyee, Cooranbong, and Rathmines should be prioritised for fibre-to-the-premises (FTTP) upgrades. These areas are experiencing slower broadband speeds due to their reliance on older technologies like FTTN, which are no longer sufficient to support modern internet demands, especially as more people work remotely and access bandwidth-heavy applications.

  Advocate for NBN Co to accelerate fibre upgrades in these suburbs to ensure faster and more reliable broadband service.

- [ ] **Deploy fixed wireless and satellite solutions for remote areas:**

  Encourage the use of fixed wireless or satellite services, such as those offered by Starlink, Optus, and Telstra's low-orbit satellites, for particularly remote areas that may not see immediate fibre upgrades. These services can provide faster, more reliable connections compared to the outdated copper-based technologies still prevalent.

  Promote partnerships with satellite providers to fill the coverage gaps in locations that are geographically difficult to reach with fibre.

- [ ] **Establish public Wi-Fi hotspots in gap areas:**

  In regions like Wyee Point and Killingworth, which may experience ongoing delays in fibre rollout, public Wi-Fi hotspots can provide interim solutions to improve digital accessibility for residents and businesses.

  Collaborate with local council and telecommunications providers to install public Wi-Fi in high-traffic areas such as community centres, and libraries.

- [ ] **Advocate for faster rollout of NBN Co's multi-gigabit services:**

  Given the upcoming multi-gigabit upgrades from NBN Co, advocate for these enhancements to be expedited in Lake Macquarie's underserved areas. This would support future growth, especially as the region's population is expected to increase by 39,000 by 2041, creating higher demand for high-speed Internet.

- [ ] **Monitor and address performance gaps regularly:**

  Create a task force or committee to regularly monitor broadband performance in both urban and outer urban areas of Lake Macquarie. Using speed test data and resident feedback, this group could identify new gaps as they emerge and work proactively with NBN Co and other providers to address them.

Addressing these broadband gaps is essential for ensuring that all parts of Lake Macquarie can thrive in the digital age. High-speed Internet is no longer a luxury but necessary for economic growth, social inclusion, and overall quality of life. By prioritising fibre upgrades and promoting alternative connectivity solutions in underserved areas, Lake Macquarie can future-proof its digital infrastructure and ensure its residents and businesses remain connected, competitive, and ready for the future.

Data sources:

- NBN Co Fibre Rollout Map: This map highlights the areas where Fibre rollouts have occurred, and which still depends on older technologies such as FTTN or Fixed Wireless. Access it here: NBN Co Fibre Rollout Map: https://www.nbnco.com.au/learn/rollout-map
- NBN Co Media Release on multi-gigabit upgrades scheduled for completion by 2025, which provides insights into planned enhancements: NBN Co Media Release: https://www.nbnco.com.au/corporate-information/media-centre/media-statements/higher-speed-tiers-multi-gigabit-speeds-in-2025
- Accenture Report: This report discusses the economic impact of NBN investment in Australia, which helps frame the importance of upgrading outer urban broadband infrastructure: https://www.nbnco.com.au/content/dam/nbn/documents/about-nbn/reports/reports-and-publications/accenture-2024-economic-and-social-impact-methodology-report.pdf
- National Co - provides insights into the transition from copper-based networks to fibre-optic broadband. They have publicly available reports and plans showing their commitment to upgrading Australia's internet infrastructure with fibre connections. You can find more details in NBN's official reports and website: https://www.nbnco.com.au/learn/network-technology/fibre
- Telstra: Telstra's resources explain the differences between broadband technologies, particularly in Australia. Their materials often highlight the shift from copper to Fibre and the benefits of the newer infrastructure. https://www.telstra.com.au/exchange
- Australian Communications and Media Authority (ACMA): ACMA provides regulatory oversight and publishes detailed reports on Australia's telecommunications infrastructure, including broadband networks and the impacts of transitioning to fibre-optic services. https://www.acma.gov.au
- OECD Digital Economy Papers: These papers provide insights into the global shift from copper networks to Fibre, comparing various countries' strategies for improving broadband infrastructure. https://www.oecd-ilibrary.org/digital-economy
- Lake Macquarie Population Growth and Economy Lake Macquarie Population Growth and EconomyMobile Networks

Mobile networks

What is mobile coverage?

Mobile coverage refers to the availability and strength of the signal that connects your mobile device to nearby cell towers using radio waves. Mobile signals require a clear line of sight between your phone and the tower for optimal performance. However, several factors can impact the quality and consistency of mobile coverage.

Physical barriers - like buildings, particularly those constructed with dense materials such as concrete, metal, or glass, can block or weaken the signal, leading to poor reception indoors. Natural obstacles, such as mountains, hills, and dense forests, can also disrupt mobile signals since radio waves struggle to travel through or around solid terrain. As a result, outer urban and mountainous regions often experience patchy coverage compared to flatter areas. This is why certain areas near Caves Beach, in particular, can be difficult to get mobile coverage.

In addition to physical obstructions, environmental factors can play a role. For example, while clouds and rain generally don't disrupt mobile signals, extreme conditions such as heavy smoke from bushfires or severe storms can cause temporary signal degradation. Power outages and floods can also have a major impact on mobile coverage. Suppose a mobile tower loses power and lacks a backup generator. In that case, the tower will go down, cutting off mobile service in the affected area until power is restored. This issue becomes particularly critical during floods or natural disasters when communication is essential, but infrastructure may be compromised.

Another challenge is network congestion. As more people move away from landlines and rely solely on mobile phones, the demand for mobile networks has increased, especially during peak times. In holiday areas that experience an influx of visitors, mobile networks can become congested, leading to slower or unreliable service due to the sheer number of users accessing the same network.

To help mitigate these issues, providers recommend using the NBN network when available for Wi-Fi calling. This can improve call quality and ensure consistent communication. Additionally, Wi-Fi calling is especially helpful during severe weather events, where traditional mobile coverage might be disrupted. Still, internet access through the NBN remains available. However, extreme flooding events will most likely severely impact the NBN network.

By understanding the factors that impact mobile coverage—from physical obstructions and environmental disruptions to network congestion—users can better navigate connectivity challenges and take advantage of alternative solutions like Wi-Fi calling to maintain reliable communication.

Understanding 3G, 4G, and 5G mobile networks

3G (Third Generation)

Introduction: In the early 2000s, 3G was a significant upgrade from 2G. It introduced mobile data capabilities, allowing users to access the Internet from their phones for the first time. It provided the foundation for mobile web browsing, email access, and media streaming.

Speed & technology: 3G networks offer speeds of up to 2 Mbps and can handle mobile internet browsing, email, and some forms of video streaming, but they struggle with high-bandwidth applications such as H.D. video and large downloads.

Use case: Initially, 3G enabled the rise of smartphones, mobile Internet, and apps that required more data transmission, such as social media and video calls.

Why mobile providers are closing the 3G network

Mobile providers worldwide, including Australia, are shutting down 3G networks to focus resources on newer technologies like 4G and 5G. Here's why:

1. Spectrum reallocation: The radio spectrum used by 3G is valuable and finite. Providers want to repurpose this spectrum for 4G and 5G, which are much more efficient and can handle far more data. By closing 3G, providers can allocate that spectrum to boost the capacity and performance of 4G and 5G networks, making better use of the available bandwidth.

2. Outdated technology: 3G is now an older technology with much slower speeds and higher latency compared to 4G and 5G. Modern applications, such as high-definition streaming, video conferencing, and mobile gaming, require more bandwidth and speed than 3G can provide. Most consumers have already transitioned to 4G or 5G devices.

3. Maintenance costs: Maintaining 3G networks is costly for mobile providers, as the infrastructure is aging and needs constant upkeep. By shutting down 3G, providers can redirect their resources to enhance 4G and 5G networks, which offer better performance and a more sustainable solution for future growth.

4. Consumer transition: Most consumers have moved to 4G or 5G-capable devices, reducing the need for 3G. Providers want to encourage the remaining users to upgrade to newer devices and plans, ensuring everyone can benefit from faster, more reliable connections.

5. Preparing for future technology: Shutting down 3G helps providers focus on future-proofing their networks for the next-generation technologies, such as 6G, which will eventually require even more spectrum and infrastructure development.

Impact on Consumers

While 3G shutdowns may affect some users, such as those using older phones or in areas where 3G was the primary signal, mobile providers are offering support for upgrading devices and transitioning to 4G or 5G. Additionally, alternative technologies like Direct-to-Handset (DTH) satellite connectivity, public Wi-Fi, and VoLTE (Voice over LTE) ensure that users in remote areas or with older devices can maintain connectivity.

4G (Fourth Generation)

Introduction: Introduced in the late 2000s, 4G marked a significant improvement over 3G, providing much faster speeds and lower latency. It allowed users to stream H.D. videos, play mobile games with real-time connections, and access richer online services.

Speed & technology: 4G can achieve speeds of up to 100 Mbps to 1 Gbps, enabling much smoother browsing, faster downloads, and more interactive mobile apps. 4G LTE (Long-Term Evolution) is the most common version of 4G used globally.

Use case: 4G networks laid the foundation for modern mobile experiences, including video streaming in H.D., video conferencing, mobile gaming, and faster downloads of large files. It became the standard for mobile connectivity for many years.

5G (Fifth Generation)

Introduction: Launched in the late 2010s, 5G is the latest evolution in mobile network technology. It offers much faster speeds and significantly reduced latency, enabling a new range of possibilities, such as real-time communication for virtual reality (V.R.), augmented reality (A.R.), and autonomous vehicles.

Speed & technology: 5G can achieve speeds of up to 10 Gbps and has a latency of under 10 milliseconds, making it ideal for highly interactive applications like gaming, video conferencing, and emerging technologies such as the Internet of Things (IoT). It also supports massive numbers of connected devices in a single area.

Use case: 5G is expected to drive advancements in smart cities, autonomous driving, remote surgeries, and other data-heavy applications. Its increased capacity and speed are crucial for the future of mobile communication and industries that rely on real-time data.

In summary, the closure of 3G networks is part of a broader strategy to modernise mobile infrastructure. This strategy allows for better use of spectrum and more efficient, faster, and higher-capacity networks to meet the growing demand for data-driven services. This shift will help support the digital economy and prepare for emerging technologies.

Satellite support

How satellites are supporting mobile coverage

Telstra's Low-Earth Orbit (LEO) satellites and Starlink are exciting technologies designed to enhance mobile networks, particularly in remote and underserved areas. However, while they offer significant benefits, it's important to understand that satellite technology still has limitations and is not a flawless solution for uninterrupted communication.

How Telstra's low-orbit satellites support mobile networks

Telstra is on track to fully implement its LEO satellites by 2025. These satellites orbit much closer to Earth than traditional satellites, providing faster Internet and mobile data connections with lower latency. This proximity enables better performance for services like video calls, internet browsing, and streaming, making LEO satellites particularly useful in outer urban or hard-to-reach areas.

Telstra's LEO satellites will work seamlessly alongside its terrestrial mobile network. When users move into an area with weak or no mobile coverage, their device will automatically transition to the satellite connection without noticeable disruption. This ensures continuous service even in remote locations, supporting everything from calls to internet usage. Telstra is also working on Direct-to-Handset (DTH) services, which will initially allow text messaging via satellite, expanding to voice and low-speed data capabilities by 2025.

Other providers utilising low-orbit satellites

Other mobile providers like Optus are also exploring LEO satellites to expand their outer urban coverage. As LEO technology becomes more accessible, we can expect more providers to integrate it into their service areas, helping bridge the digital divide between urban and outer urban areas.

How Starlink supports mobile networks

Starlink, operated by SpaceX, is already operational and provides high-speed, low-latency internet globally through its LEO satellite network. Starlink is beneficial for users in outer urban areas where mobile networks are weak. It offers download speeds of 50 Mbps to 150 Mbps. However, its performance can be impacted by environmental factors such as dense clouds, heavy rain, or smoke. Despite being highly reliable, Starlink's service is more costly, starting at AUD $139/month with an upfront equipment cost of AUD $924. (Pricing has been noted as of October 2024.

Limitations of satellite technology

While LEO satellites bring many advantages, they are not immune to environmental disruptions. Factors like dense cloud cover, heavy rain, snow, and smoke can weaken or interrupt satellite signals. This is because satellite radio waves can be scattered or absorbed by these weather conditions. Furthermore, physical obstructions such as mountains, tall buildings, and dense trees can block signals, particularly in areas where the satellite's line of sight is compromised.

Additionally, while LEO satellites reduce latency compared to traditional geostationary satellites, users may still experience delays during adverse weather conditions or high congestion periods. Electromagnetic interference from nearby electronic devices or equipment can also affect the signal quality.

Seamless transition between mobile towers and satellites

A significant advantage of Telstra's LEO satellite system is the seamless transition between terrestrial mobile towers and satellite networks. As users move between areas with varying mobile coverage, their device automatically switches between the two networks without disruption. This seamless handover ensures that users can maintain calls, internet browsing, or streaming services, even in areas with poor mobile signal coverage.

Understanding Satellite Types: LEO, GEO, MEO, DTH

Several types of satellite technologies serve different purposes:

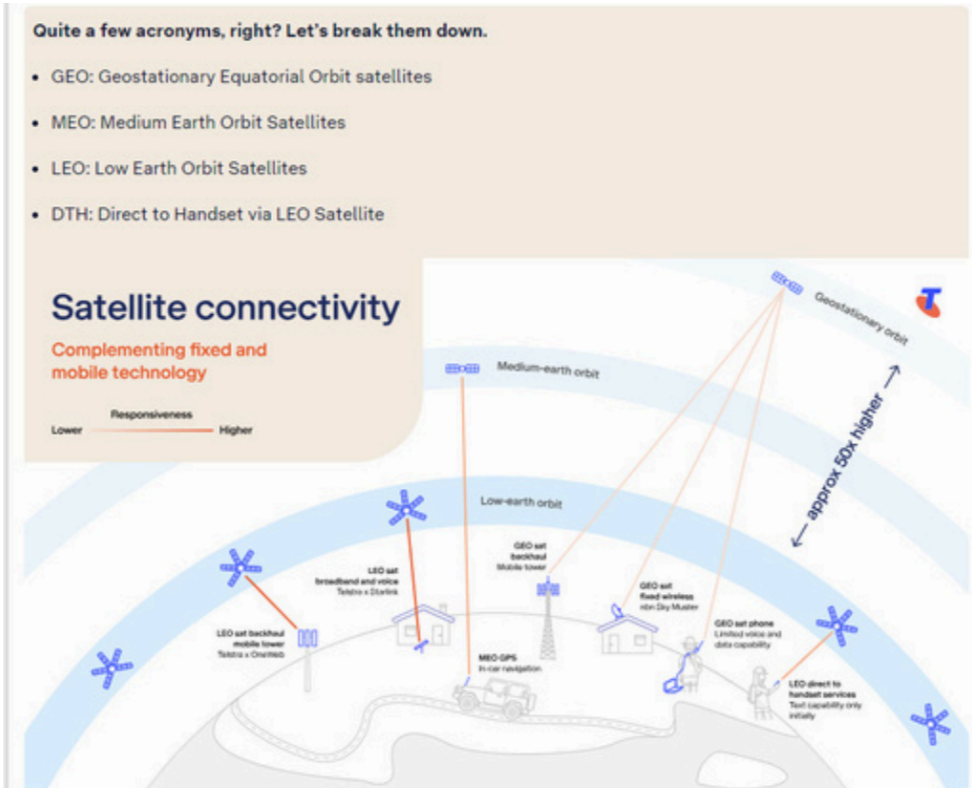

Image 1. Satellite Connectivity diagram from the Telstra website. See the supporting data source link below.

- LEO (Low-Earth Orbit) satellites orbit at altitudes of 160 to 2,000 km above Earth. Due to their low latency, they are ideal for fast Internet and mobile data services. However, they cover smaller areas, so constellations of many satellites are required for global coverage.
- MEO (Medium-Earth Orbit) satellites are positioned higher, around 10,000 km, and are primarily used for GPS and navigational systems. While they offer broader coverage than LEO satellites, they have slightly higher latency.
- GEO (Geostationary Equatorial Orbit) satellites orbit at 35,000 km and can cover large areas of the Earth with just a few satellites. These are used for TV broadcasts and satellite phones but suffer from high latency due to their distance from Earth.
- DTH (Direct-to-Handset) services, an emerging technology, will eventually allow mobile phones to communicate directly with LEO satellites for basic connectivity like text messaging and, in the future, voice and data services.

In summary, while LEO satellites from Telstra and Starlink offer significant improvements in mobile coverage for remote areas, they are not immune to weather-related disruptions or physical obstructions. However, the seamless transition between mobile towers and satellite connections provides a robust solution to maintaining uninterrupted service in most conditions, making them a critical part of the future of mobile communication.

Lake Macquarie Digital Infrastructure - Current Assessment

- **Mobile Coverage**
- **Public Wi-Fi**
- **Education**

Mobile Coverage

Telstra, Optus, and Vodafone primarily provide mobile coverage across Lake Macquarie. While the region's urban areas enjoy strong 4G and 5G coverage, some outer urban parts experience poor or inconsistent signals. Maps from Telstra and Optus reveal that certain low-density areas may lack reliable high-speed mobile coverage.

The main mobile network providers serving the Lake Macquarie region are:

1. Telstra

Coverage: Telstra offers the most extensive coverage in both urban and outer urban areas of Lake Macquarie, with strong 4G and growing 5G services. Telstra's network is known for its reliability, particularly in more remote or less densely populated areas.

Strengths: Excellent in outer urban areas, higher speeds, and best overall mobile and data services coverage.

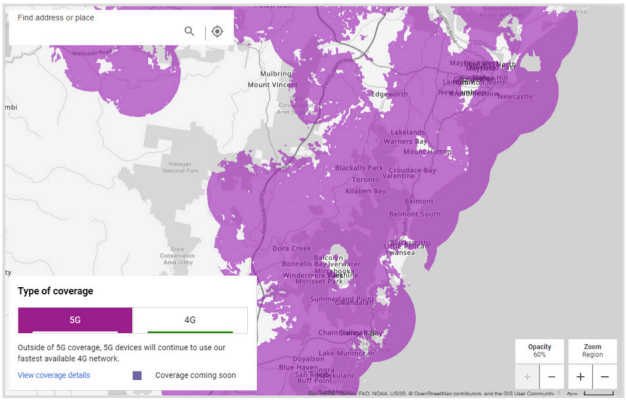

Image 2. 5G heat map from the Telstra website. See the supporting data source link below.

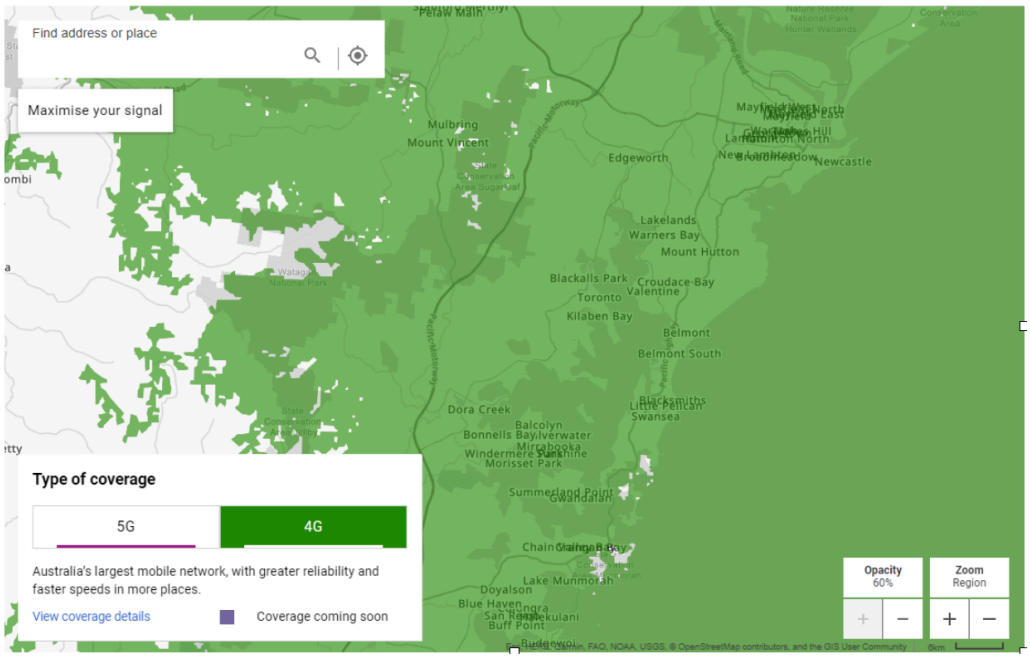

Image 3. 4G heat map from the Telstra website. See the supporting data source link below.

2. *Optus*

Coverage: Optus provides good coverage in urban areas and along the coastline of Lake Macquarie. However, it may not be as strong as Telstra in some of the more remote or inland regions. Optus is rolling out 5G services across the region, focusing on improving coverage.

Strengths: Competitive pricing and fast data speeds, particularly in urban areas.

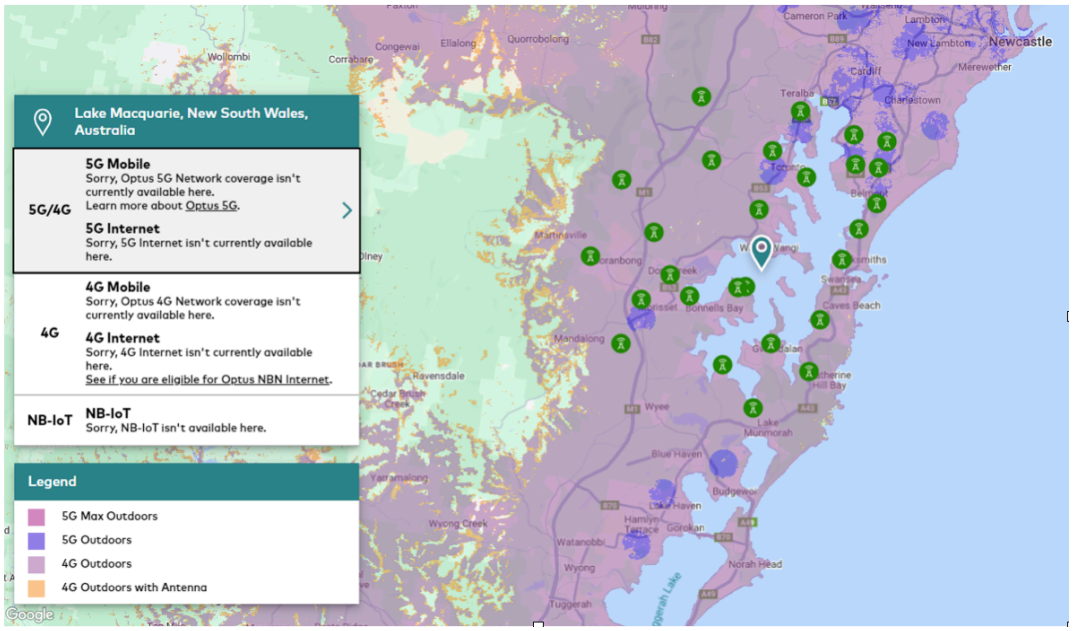

Image 4. Coverage heat map and towers from the Optus website. See the supporting data source link below.

3. *Vodafone (TPG Telecom)*

Coverage: Vodafone has reasonable coverage in the more densely populated areas of Lake Macquarie, such as Charlestown, Belmont, and Warners Bay. However, its coverage in outer urban and remote areas is generally weaker than that of Telstra and Optus.

Strengths: Good for urban use and competitive plans, especially in more central locations.

4. *MVNOs (Mobile Virtual Network Operators)*

In addition to the major providers, various MVNOs offer services using Telstra, Optus, and Vodafone networks. These include providers like Boost Mobile (using Telstra's Network), Amaysim (using Optus's Network), and TPG (using Vodafone's Network). They often offer more affordable plans but with the same coverage as the major networks they rely on.

These providers offer a mix of coverage and service quality, depending on whether you're in more urban or outer urban parts of Lake Macquarie. Due to its broader reach, Telstra tends to be the preferred provider for businesses and residents in more remote locations.

Mobile Tower Status in Lake Macquarie

To keep up to date with the status of mobile towers and infrastructure in Lake Macquarie, the Radio Frequency National Site Archive (RFNSA) provides a useful interactive map. This tool allows users to view detailed information about existing mobile towers, their technology (e.g., 4G, 5G), and any planned new developments or upgrades.

See the image below. This information is essential for residents looking to understand mobile service quality in their area and businesses planning connectivity-dependent operations.

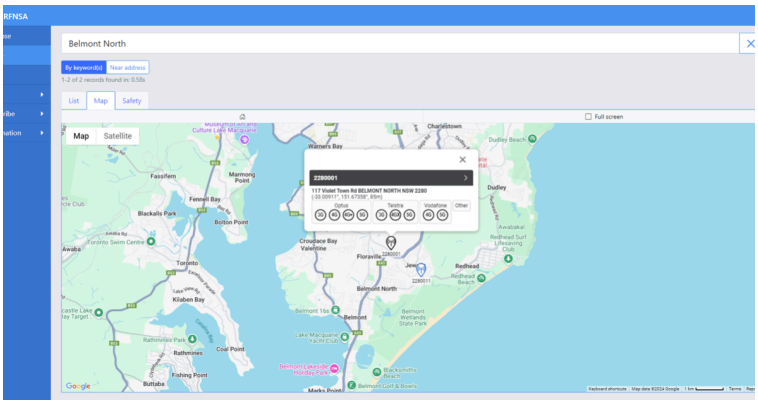

Image 5. Tower information for Belmont from the RFNSA website.

Below is a map of Morisset, showing the tower located at 15 Kalaf Avenue, Morisset NSW 2264, which currently only has Optus as a provider. Typically, each tower should accommodate at least two mobile service providers. Meanwhile, the tower at 40 Ourimbah Street (Lot 2 on DP1143022), Morisset NSW 2264, hosts both Telstra and Vodafone. Additionally, there are four blue icons on the map indicating planned locations for future towers.

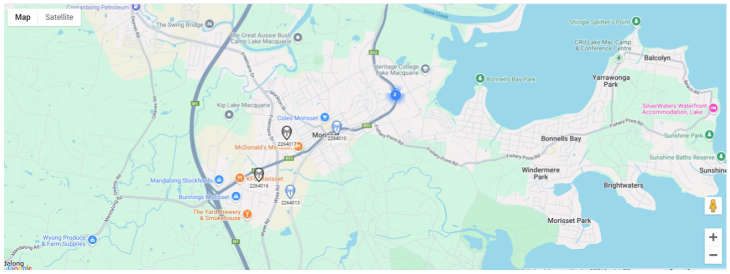

Image 6. Tower information for Morisset from the RFNSA website.

Why Use the RFNSA Map?

Up-to-date information: The RFNSA map is regularly updated to ensure you have the latest information on mobile network infrastructure.

Network type and provider details: Users can quickly identify whether the available infrastructure supports 5G, which can be crucial for accessing faster internet speeds.

Planning for connectivity: Knowing if there are any D.A.s lodged for new towers can help anticipate changes in coverage, which is useful for residents, businesses, and local authorities planning infrastructure projects. Using the RFNSA tool, Lake Macquarie residents can better understand the mobile infrastructure landscape, keep track of ongoing developments, and make informed decisions regarding connectivity options.

Identified gaps

Mobile network coverage, particularly 4G and 5G, is strong in the densely populated urban areas but weak or inconsistent in outer urban and isolated parts of Lake Macquarie. Coastal areas and regions towards the southern parts of the lake, as well as certain hilly or heavily forested zones, have poor mobile reception or lack 5G coverage entirely.

Urban areas: Good to excellent 4G and 5G coverage in and around key hubs such as Charlestown, Belmont, and Warners Bay. Coverage in these areas supports businesses and residential users well.

Outer-urban areas: Outer urban localities like Morisset and Wyee experience inconsistent or weaker 4G coverage and a very limited 5G presence. This lack of robust mobile connectivity affects residents and businesses, hampering access to essential online services and creating digital exclusion.

Recommendations

Based on Lake Macquarie's current and projected population growth, the increasing demand for new dwellings, and the significant role mobile connectivity plays in both personal and business activities; several actionable recommendations can be made to enhance digital infrastructure and ensure the region remains competitive in the digital economy.

- [ ] **Improve mobile coverage in growth areas**

  With Lake Macquarie's population expected to grow by 39,000 people by 2041 and the need for 12,000 new dwellings, expanding mobile network coverage, particularly in areas slated for new development, is essential. Given the current outer urban and coastal areas with weak or patchy mobile signals, targeted investments should be made in extending 4G and 5G coverage into these regions to support population growth.

  Action: Collaborate with major mobile providers (Telstra, Optus, Vodafone) to prioritise network expansion in high-growth areas and new housing developments, ensuring adequate infrastructure is in place as these regions develop.

- [ ] **Ensure seamless mobile tower-to-satellite handover**

  Since Lake Macquarie is a mix of urban, outer urban, and coastal environments, satellite connectivity should bolster mobile networks. With Telstra's low-earth orbit (LEO) satellites coming online by 2025 and Starlink already operational, the seamless transition between mobile towers and satellites can ensure that even the most remote areas of Lake Macquarie have reliable coverage.

  Action: Leverage Telstra's and Starlink's satellite technology to provide backup coverage in areas where mobile towers may struggle due to geographical limitations. This will ensure continuous service during emergencies or in isolated areas where terrestrial networks are insufficient.

- [ ] **Strengthen infrastructure for peak periods and population influx**

  Lake Macquarie is a popular destination for both tourists and seasonal visitors. These influxes, particularly during holidays, can strain the existing mobile network infrastructure, leading to congestion and slower speeds. To address this, additional infrastructure and temporary solutions should be explored.

  Action: Advocate for deploying mobile small cells or temporary mobile towers known as Cell on Wheels (COW), which is ideal for events with large crowds or during known peak periods to manage tourist network congestion. Encourage mobile providers to invest in capacity upgrades in high-demand zones during holiday periods or review co-contribution partnerships.

- [ ] **Expand 5G networks to support future growth**

  As Lake Macquarie continues to grow, 5G will become increasingly important for enabling smart city technologies, advanced manufacturing, and supporting high-speed data requirements for both residents and businesses. Currently, 5G coverage is concentrated in urban areas, and its expansion will be vital for future economic growth.

  Action: Encourage further investment in 5G infrastructure across the region to ensure all areas, including strategic planning of infrastructure before residents move into newly developed housing estates and industrial zones, having access to high-speed, low-latency mobile data will be a draw card for relocations. This will support the region's growing population and economy.

- [ ] **Integrate satellite technology into emergency response plans**

  Given the region's susceptibility to natural disasters such as bushfires and floods, which can disrupt mobile towers, integrating satellite technology into emergency communication systems is critical. LEO satellites and Starlink can provide communication backup when terrestrial networks fail.

  Action: Work with local emergency services, mobile providers, and NBN Co to implement a satellite-based communication system as a contingency during emergencies. Ensure public awareness and educational campaigns are implemented, and residents are informed about using satellite-based services like Wi-Fi calling if the fibre network isn't interrupted and satellite internet during network outages.

- [ ] **Encourage public Wi-Fi and 5G hotspots in key areas**

  To improve mobile accessibility, public Wi-Fi and 5G hotspots should be expanded, especially in community hubs, shopping districts, and areas of high population density. This will alleviate pressure on mobile networks and ensure residents and visitors can access reliable internet services.

  Action: Partner with mobile providers and local businesses to install public Wi-Fi and 5G hotspots in key commercial areas, parks, and transport hubs. This will enhance connectivity for residents, students, tourists, and businesses. Educate the community on how to use public Wi-Fi safely.

- [ ] **Monitor and enhance network resilience**

  As more people rely solely on mobile phones, the resilience of the mobile network becomes crucial. Power outages, floods, and bushfires can take down mobile towers, especially if backup power solutions are not in place. Mobile infrastructure must be resilient to withstand such events.

  Action: Advocate for mobile providers to ensure backup power generators are installed at mobile towers, particularly in vulnerable areas. Review co-contribution partnerships with mobile tower owners, as other areas in Australia are on a higher priority list for generators. This will maintain mobile connectivity during power outages, especially in emergency situations.

As Lake Macquarie's population continues to grow and mobile connectivity becomes increasingly vital, it's essential to take a diversified approach to digital infrastructure. No single technology—whether mobile towers, fibre networks, or satellite systems—can guarantee 100% reliable communication on its own. A collaborative strategy that combines various technologies, such as 5G networks, public Wi-Fi, and satellite systems, will provide a more resilient and dependable communication framework for residents and businesses.

The Lismore floods in 2022 underscored the importance of such an approach. During the floods, widespread power outages caused mobile towers and fibre networks to go down, leaving thousands of residents without access to essential services or communication for days in some cases. This situation highlighted the vulnerabilities of relying solely on terrestrial infrastructure during extreme weather events. Once the cloud coverage began to thin, there were opportunities where satellite technology, such as LEO satellites, could have been used to restore communication quicker, providing crucial backup connectivity.

In light of these lessons, it is essential to educate the community on the importance of diversifying their connectivity options. Relying solely on one method, such as mobile towers, may not suffice in a disaster. Satellite-based systems, for example, can serve as a backup during power outages or infrastructure failures. Furthermore, integrating emergency communication plans will be critical, ensuring residents know how to access satellite-based services like Direct-to-Handset (DTH) or Wi-Fi calling during an emergency when traditional networks are compromised. A diversified and resilient digital infrastructure will support Lake Macquarie's future growth and ensure that residents are better prepared for emergencies. This will reduce the likelihood of communication failures in critical moments. This collaborative approach will strengthen the region's digital ecosystem, making it more adaptable to growth and unforeseen disruptions.

Data Sources:

- Telstra Coverage Maps: Our Network Coverage & Rollout Maps - Telstra
- Optus Coverage Maps: Network Coverage Maps - Optus
- Mobile Coverage Australia: 5G & 4G Coverage Map New South Wales for Telstra, Optus, Vodafone Mobile Coverage Checker by postcode for all Australian networks with one search | Mobilecoverageaustralia.com
- Telstra Satellites information - What are LEO satellites, and how do they work? How we're working to improve connectivity with LEO satellites - Telstra Exchange
- Starlink information - Starlink

Public Wi-Fi

Public Wi-Fi refers to freely accessible wireless Internet in public spaces such as shopping precincts, libraries, community centres, and transport hubs. These networks allow people to connect their devices to the Internet without relying on personal data plans or home broadband connections. Public Wi-Fi is particularly beneficial for people who lack access to high-speed Internet at home, helping bridge the digital divide in communities, especially for lower socio-economic groups.

In Lake Macquarie, public Wi-Fi is available in key urban areas like Charlestown, Swansea, and other major shopping centres and community spaces. However, access to public Wi-Fi is far less prevalent in more remote or outer urban parts of the region, such as Wyee, Morisset, and Cooranbong, creating a digital divide between different areas. This divide limits access to essential online services for resident’s dependent on public Wi-Fi for financial reasons.

Bridging the digital divide

Expanding public Wi-Fi access can be crucial in bridging Australia's digital divide, particularly for lower socio-economic demographics. Many people from disadvantaged backgrounds may not have the financial means to afford home internet or expensive data plans. Public Wi-Fi offers a lifeline for these individuals, enabling access to crucial services such as online banking, government services, education, and job search platforms.

This is especially important given that the Australian Digital Inclusion Index has shown that low-income households are significantly less likely to access high-quality internet services, creating barriers to digital participation. By providing accessible public Wi-Fi, communities can help reduce these households' financial pressures, ensuring they are not left behind as the world becomes increasingly digital.

Telstra's public Wi-Fi initiative

One of the more significant public Wi-Fi initiatives in Lake Macquarie is Telstra's free Wi-Fi, which is available at public phone booths. Telstra has converted many of its public pay phones into Wi-Fi hotspots, offering free access to the Internet in areas where traditional public Wi-Fi might not be available. This service is particularly beneficial in areas where lower-income communities reside, allowing them to access the Internet for free and stay connected. Noting the speeds can be slower.

By providing free Wi-Fi access through these phone booths, Telstra is helping to bridge the digital divide and supporting people who may otherwise struggle to afford internet access. This service is essential for those relying on public Wi-Fi for everyday tasks, such as schoolwork, job searches, and government services.

The benefits of expanding public Wi-Fi

Expanding public Wi-Fi access can provide multiple benefits, particularly for lower socio-economic groups, while also supporting local businesses and the wider community:

Reducing financial pressure: Free public Wi-Fi minimises the need for low-income families and individuals to spend on expensive mobile data or home broadband services. This can alleviate some financial burdens associated with staying connected in a digital-first world, ensuring all residents can access essential online services.

Supporting digital literacy and inclusion: Public Wi-Fi can help increase digital literacy by allowing people to practice online skills, access educational materials, and participate in online learning. This is especially important for students from disadvantaged backgrounds who cannot access reliable Internet at home. Expanding public Wi-Fi networks ensures they have equal opportunities to pursue education and personal development.

Attracting customers and supporting local businesses: Businesses that offer free Wi-Fi are more likely to attract customers who stay longer and potentially spend more. Cafes, restaurants, and shopping centres that provide free Wi-Fi can use this as a draw for foot traffic, increasing sales and encouraging loyalty. Local businesses in lower-income areas can particularly benefit from this model, as they can attract a more diverse clientele.

Enhancing community and social support: Public Wi-Fi networks foster a sense of community by providing spaces where residents can connect, access services, and engage in online social activities. Free Internet in public parks, community centres, and libraries creates inclusive spaces where everyone can connect and participate in the digital world, regardless of their financial situation.

Improving access to government services: Many government services are increasingly moving online, making reliable internet access essential for citizens. Public Wi-Fi enables low-income individuals to access important services, such as social benefits, job applications, and housing support, without the financial burden of maintaining a costly internet plan.

Education

Educating the community on the safe use of public Wi-Fi

While public Wi-Fi offers many benefits, such as increased digital access and reduced financial burdens, it also comes with potential cybersecurity risks. Open Wi-Fi networks can be vulnerable to cyberattacks, such as man-in-the-middle attacks, where malicious actors intercept the data being sent over the Network. Users of public Wi-Fi networks need to be aware of these risks and take appropriate precautions to protect their personal information and devices.

Below are some key cybersecurity best practices for using public Wi-Fi safely:

- Avoid accessing sensitive information
- Use a Virtual Private Network (VPN)
- Turn-Off sharing features
- Ensure the Wi-Fi network is legitimate
- Keep Devices Updated
- Use HTTPS websites
- Provide community digital education workshops

One effective way to promote safe public Wi-Fi usage is by offering digital education workshops that teach the community about online safety. These workshops can cover key topics such as cybersecurity best practices, using VPNs, and recognising secure websites. It is recommended that providers such as Telstra or Optus be reached out to, who may be able to conduct free workshops for the community. By educating residents, especially those who rely on public Wi-Fi, on how to protect their personal information and devices, Lake Macquarie can ensure greater digital literacy and safe internet usage across the community.

This initiative would increase awareness about the potential risks of using public Wi-Fi and empower residents to make informed decisions about their online activities. In the long term, this would promote safer digital uptake, enabling all residents to participate in the digital economy confidently and securely.

Recommendations

- [ ] **Target underserved areas:**

  Public Wi-Fi should be expanded to underserved areas like Wyee, Cooranbong, and Rathmines, where internet access is limited. Offering public Wi-Fi in parks, community halls, and other public spaces can bridge the connectivity gap in these areas.

- [ ] **Leverage Telstra Air Networks:**

  Advocate or explore partnerships to expand Telstra's Wi-Fi hotspot network to cover more remote areas by installing additional Wi-Fi-enabled public phone booths in lower-income suburbs. This will provide free internet access in locations where building new infrastructure is cost prohibitive.

- [ ] **Support for local businesses:**

  Encourage local businesses to offer free Wi-Fi to customers, particularly in lower-income areas. Partnering with businesses to offer incentives, such as promotions or tax reductions, can help encourage the establishment of Wi-Fi zones in underserved areas.

- [ ] **Focus on community hubs:**

  Prioritise the installation of public Wi-Fi in community hubs like libraries, community centres, and public transport hubs in disadvantaged areas, ensuring that residents can access the Internet for education, job opportunities, and social services.

Expanding public Wi-Fi access is critical to closing the digital divide in Lake Macquarie, especially for lower-income and outer urban communities. Public Wi-Fi reduces financial pressures on disadvantaged households and supports digital literacy, social inclusion, and economic growth. By leveraging initiatives like Telstra's free Wi-Fi on public phones and exploring partnerships for expanding access to more areas, Lake Macquarie can ensure that all its residents have equal access to the digital world, ensuring no one is left behind.

Data Source

- Australian Cyber Security Centre - Public Wi-Fi Safety Connecting to public Wi-Fi and hotspots | Cyber.gov.au
- Stay Smart Online - How to Stay Safe on Public Wi-Fi How to stay safe on public Wi-Fi | SafeWise
- Local Council Public Wi-Fi Availability: Lake Macquarie City Council (infrastructure maps available upon request)
- Telstra Air Public Wi-Fi - Free Wi-Fi is now available to anyone across selected Telstra payphones - Telstra Exchange
- Australian Digital Inclusion Index https://digitalinclusionindex.org.au/

Data Centre Opportunities

What are data centres?

Data centres are specialised facilities designed to store, manage, and process vast amounts of data. These centres are vital for businesses and industries that rely on cloud services, big data, and high-speed data storage. Data centres host essential I.T. infrastructure, such as servers, storage devices, and networking components, ensuring reliable data access, processing power, and cybersecurity for users.

Image 7. Image of a Data Centre.

Benefits of Data Centres

Enhanced data security and sovereignty: Locally operated data centres provide greater control over data sovereignty, which refers to the laws and governance regarding where data is stored and processed. With the increasing importance of protecting sensitive information, keeping data within Australian borders ensures that it is subject to Australian privacy laws, such as the Privacy Act 1988. This mitigates risks associated with foreign laws, such as the U.S. CLOUD Act, which may require global companies to share data stored in their foreign data centres with international governments.

Faster data access and reduced latency: Data centres near users reduce latency, which improves the speed at which data can be accessed and transferred. This is critical for industries requiring real-time data processing, such as advanced manufacturing, healthcare, and financial services.

Support for local economic growth: Establishing data centres in Lake Macquarie would position the region as a key player in the digital economy. By attracting tech-driven businesses and startups, local data centres can create job opportunities and support the growth of emerging industries. It also aligns with Australia's broader strategy to build a more resilient and self-sufficient digital infrastructure.

Data sovereignty and national security: Hosting data locally strengthens Australian sovereignty by ensuring that critical data is managed under Australian jurisdiction. Data sovereignty has become increasingly significant for government agencies and industries dealing with sensitive information, such as healthcare and defence. Locally managed data centres allow the government and businesses to retain full control over their data, safeguarding it from potential foreign interference or unauthorised access.

Identified gaps

Currently, Lake Macquarie has limited local data centre infrastructure, with most businesses relying on centres in Newcastle or Sydney. This increases latency and reduces the region's attractiveness to tech-driven industries. Local industries such as healthcare, education, and advanced manufacturing require secure, high-speed access to data. Still, the lack of nearby data centres hinders their ability to adopt data-intensive applications like Artificial Intelligence (A.I.), big data analytics, and cloud-based services.

For Lake Macquarie to fully support its smart city initiatives and meet the growing demand for digital infrastructure, it must address these gaps by developing local data centres.

Suburbs with Identified Gaps

Several areas within Lake Macquarie, including Morisset, Wyee, and Cooranbong, lack high-speed data infrastructure and face slower access. Local data centres would greatly benefit these areas by reducing latency and supporting data-intensive applications for local businesses.

Recommendations

Recommendations for expanding data centre infrastructure include:

- ☐ **Attract investment to build sovereign data centres:**

  Lake Macquarie should advocate for investment in local sovereign data centres to reduce reliance on external data centres and ensure data sovereignty. This would keep critical data within Australian borders and align with national strategies for digital infrastructure security. By partnering with companies like NextDC or Equinix, Lake Macquarie could establish locally managed data centres that comply with Australian data sovereignty laws.

- ☐ **Encourage public-private partnerships:**

  The local government could foster public-private partnerships to fund the development of data centres, particularly for sectors like healthcare and education. These partnerships would ensure that critical data remains under Australian jurisdiction and is protected by Australian privacy laws.

- [ ] **Create a digital innovation hub:**

  Establish a digital innovation hub to attract startups and tech-driven industries that depend on high-speed data access and cloud infrastructure. A locally operated data centre within this hub would position Lake Macquarie as a leader in data sovereignty while boosting local economic growth.

- [ ] **Cybersecurity and national security:**

  Strengthen cybersecurity by ensuring that all data centres built in the region comply with national security standards. This includes robust encryption, disaster recovery, and ensuring that sensitive data is hosted under Australian governance, reducing the risk of foreign interference.

- [ ] **Incentivise data centre development:**

  Government could offer incentives or subsidies to companies willing to establish data centres in Lake Macquarie. These could be aligned with green energy initiatives, ensuring that new data centres are built sustainably to reduce the environmental impact of increased energy consumption.

Expanding local data centre infrastructure is essential for Lake Macquarie to support tech-driven industries, enhance data sovereignty, and bolster national security. Investing in sovereign data centres will not only improve data accessibility and speed but also position Lake Macquarie as a hub for digital innovation and economic growth. Under Australian laws, ensuring that data is stored and managed locally will safeguard critical information and enhance the region's competitiveness in the global digital economy.

Data Sources:

- NextDC Data Centres https://www.nextdc.com/data-centres
- Equinix Data Centres https://www.equinix.com.au/locations/australia-colocation/sydney-data-centers
- Australian Government - Data Sovereignty and National Security https://www.cyber.gov.au)

Digital Literacy Program - Education

Digital literacy refers to effectively using digital technologies, including navigating the Internet, using online services, and understanding digital security. With the rapid rollout of faster broadband and mobile networks in Lake Macquarie, expanding digital literacy programs is essential to ensure that all residents can benefit from these advancements. However, significant gaps exist in the region, particularly among older residents, low-income households, and outer urban communities, where digital skills and access to these programs are limited.

Digital inclusion at the national level is 73.2, increasing from 71.1 in 2021.

The divide between capital cities and the rest of Australia remains marked. In 2023, areas outside state and territory capitals recorded a score of 3.4 points less than the national score, and 5.0 points less than capital cities. Digital inclusion decreases with remoteness, particularly in Access and Digital Ability.

In 2023, all states and territories record scores between 69 and 78. The Northern Territory records the lowest score (69) and the Australian Capital Territory continues to record the highest (78).

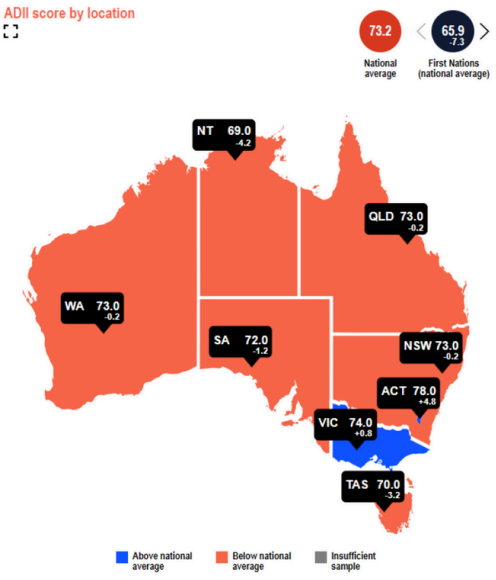

Image 8. Image of ADII score of each state in Australia.

Identified gaps

Although Lake Macquarie offers some digital literacy programs through libraries and community centres, these programs are not evenly distributed across the region. Areas such as Wyee, Cooranbong, and Morisset, where broadband infrastructure is also less developed, have fewer digital literacy initiatives, limiting residents' ability to benefit from the digital transformation taking place.

According to the Australian Digital Inclusion Index (ADII), outer urban and disadvantaged communities often experience lower levels of digital inclusion. The ADII measures access, affordability, and digital ability, with digital ability being a key area where gaps are most evident. Lake Macquarie's outer urban residents and older adults often lack the digital skills to access essential services like healthcare, education, and online government services.

Local Government Area	Score	Gap
Sydney	79.5	6.3
Central Coast	71.6	-1.6
Lake Macquarie	72.1	-1.1
Newcastle	74.8	1.6

The Australian Digital Inclusion Index (ADII) shows that Lake Macquarie scores 72.1, slightly below the national average of 73.2, with a gap of -1.1. This positions Lake Macquarie as having lower digital inclusion compared to nearby areas like Sydney (79.5), which is well above the national average. However, Lake Macquarie is closer to the national benchmark than the Central Coast, which scores 71.6. While Newcastle scores higher at 74.8, Lake Macquarie is still competitive in digital inclusion, indicating potential for targeted improvements to close the gap with both the national average and other neighbouring regions.

The importance of expanding digital literacy programs

As faster broadband and 5G mobile networks become more widely available, improving digital literacy will be essential for ensuring that residents of Lake Macquarie can fully participate in the digital economy and access basic services. The ADII highlights that digital literacy is directly linked to social and economic inclusion, meaning that those with lower levels of digital skills are more likely to be excluded from job opportunities, healthcare, and education.

The 2022 ADII report found that older Australians (65+ years) and those from low-income households scored significantly lower in digital ability compared to the broader population. In Lake Macquarie, this trend is mirrored by the difficulties faced by older adults and residents in more remote areas, who may struggle with the digital transition as services increasingly move online.

These gaps must be addressed for Lake Macquarie to remain competitive and inclusive, particularly as the region continues to invest in new digital infrastructure.

Recommendations

Recommendations for expanding digital literacy programs

- [ ] **Expand programs in outer urban areas and low-income communities:**

  Expand digital literacy workshops and resources to outer urban communities like Wyee, Cooranbong, and Morisset, which are facing infrastructure challenges and limited access to educational programs. Focusing on bringing digital skills education to these areas will help bridge the gap between urban and outer urban residents.

- **Target older residents and disadvantaged groups:**

  Given that older adults and low-income households consistently score lower on digital ability in the Australian Digital Inclusion Index (ADII), targeted programs should be developed to address these gaps. These programs should focus on teaching essential skills such as navigating telehealth services, accessing government benefits online, and understanding cybersecurity.

  To reach more older residents, a key recommendation is to collaborate with local members of parliament who already host events like the Seniors Week Expos. These expos present an ideal opportunity to offer digital literacy workshops tailored for older adults, providing hands-on experience with online tools in a supportive environment. Such collaborations would expand the reach of these programs and help bridge the digital divide among older demographics.

  Programs could also be delivered through community centres, libraries, and local senior groups, leveraging existing networks to ensure these communities can easily access training and support. By partnering with M.P.s and community organisations, Lake Macquarie can ensure that older residents and disadvantaged groups are not left behind as the region embraces faster broadband and mobile networks.

- **Partner with local businesses and NGOs:**

  Collaborating with local businesses and non-profit organisations could help expand the reach of digital literacy programs, especially in underfunded areas. Businesses could provide sponsorship or donate digital devices to disadvantaged communities, while NGOs could help deliver tailored workshops.

- **Integrate digital literacy in schools**:

  Integrating digital literacy into the school curriculum can help improve digital inclusion for future generations. Schools in Lake Macquarie can play a crucial role in ensuring that students from all backgrounds develop the digital skills they need to thrive in the future workforce—potential opportunities to link in with CSIRO Generation STEM programs.

- [ ] **Provide multilingual digital education:**

  Multilingual communities in Lake Macquarie, particularly those from non-English speaking backgrounds, may benefit from multilingual digital literacy workshops to ensure they are not left behind. This would help foster digital inclusion and improve access to online services for a more diverse population.

Addressing the digital literacy gap is crucial for ensuring that Lake Macquarie's residents can fully benefit from the development of the new broadband and mobile infrastructure. As highlighted by the Australian Digital Inclusion Index, regions with low digital ability tend to experience higher social and economic exclusion levels. By expanding digital literacy programs to reach all demographics, particularly outer urban residents, older adults, and disadvantaged groups, Lake Macquarie can ensure that no one is left behind in the digital age.

Data Sources:

- Australian Digital Inclusion Index https://digitalinclusionindex.org.au/

Smart City Technologies and IoT

- **What is IoT and how does it power smart cities?**
- **Global trends and the benefits of investing in smart city technologies**

Lake Macquarie has begun investing in smart city technologies, integrating Internet of Things (IoT) solutions to enhance urban services, improve sustainability, and promote a better quality of life for its residents. The city has already adopted technologies like smart lighting and traffic management systems. It recently began implementing sensor-equipped bins as part of its smart waste management strategy, specifically in the Warners Bay area. This trial is part of the council's broader smart city initiative to reduce operational costs and improve service delivery.

The image below describes the Telstra IoT Network in more detail.

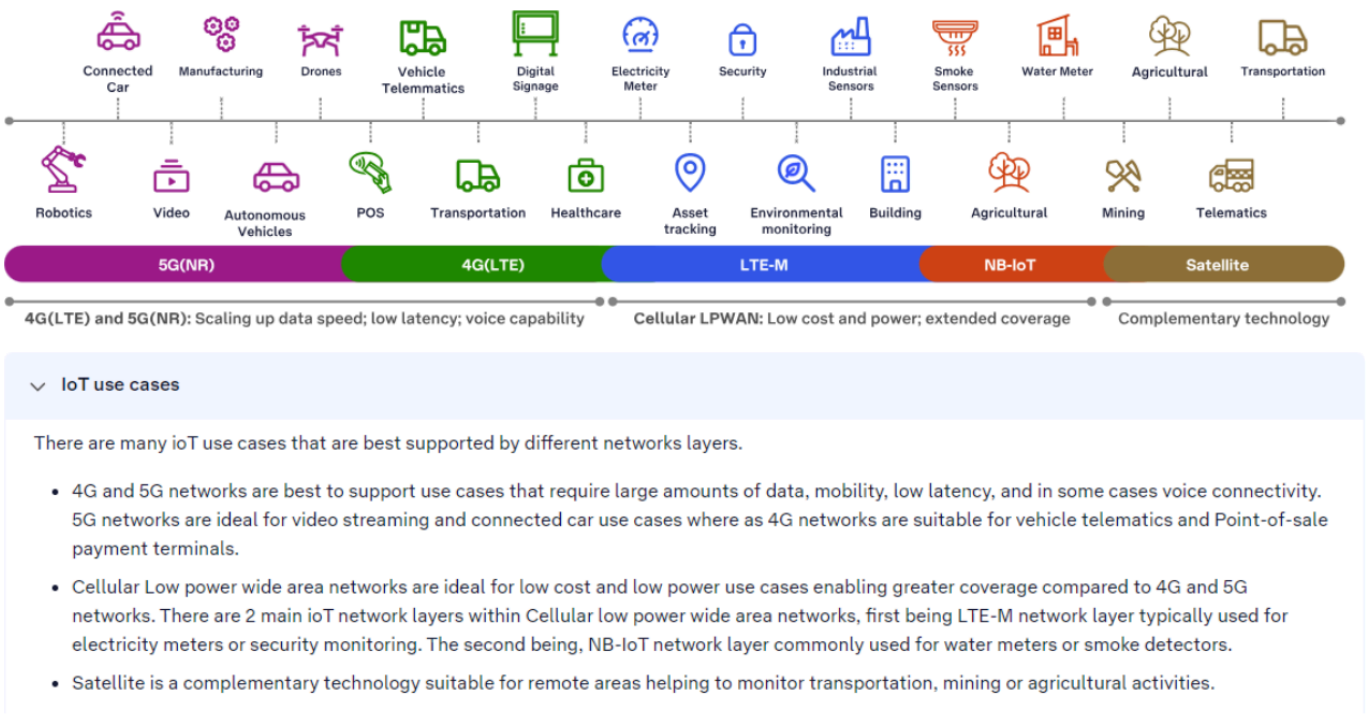

Image 9. Image taken from the Telstra IoT Network section of the website.

What is IoT and how does it power smart cities?

The Internet of Things (IoT) refers to a network of connected devices and sensors that collect and transmit data in real-time. In smart cities, IoT plays a crucial role in automating and optimising services such as waste management, environmental monitoring, traffic systems, and public safety. Global smart cities like Singapore, Barcelona, and Copenhagen have demonstrated how IoT-powered solutions lead to significant improvements in efficiency, sustainability, and urban living standards.

By 2025, an estimated 75 billion IoT devices will be in use globally, underscoring the rapid expansion of IoT in city planning. Lake Macquarie's investments in IoT will enable the city to stay competitive, attract investment, and meet the future needs of its growing population.

Identified gaps

While Lake Macquarie has made progress in adopting smart lighting, traffic systems, and trailing sensor-equipped bins in Warners Bay, there are several key areas where further expansion of IoT technologies is needed:

1. Smart waste management: Although Warners Bay has piloted sensor-equipped bins to optimise waste collection, it's unclear whether this system has been expanded to other areas of Lake Macquarie. Expanding this initiative citywide could significantly reduce waste collection costs and improve service efficiency. Similar implementations in cities like San Francisco have resulted in a 20% reduction in waste collection costs.

2. Public safety enhancements: While Lake Macquarie has installed smart lighting, further investments in IoT-based public safety systems—such as smart surveillance and real-time emergency response systems—could enhance security across the region. Smart poles come in many variations. Cities like New York have successfully reduced emergency response times by 25% through similar technologies.

3. Environmental monitoring: There is limited use of IoT environmental monitoring sensors to track air quality, water usage, and energy consumption. Expanding these systems would help Lake Macquarie meet its sustainability goals, as cities like Copenhagen have demonstrated a 10-20% improvement in energy efficiency using similar technologies.

Global trends and the benefits of investing in smart city technologies

Investing in smart city technologies is becoming an essential aspect of urban development worldwide. Global smart city trends highlight the following benefits:

Increased Operational Efficiency: IoT systems reduce the cost of city services by up to 30%, as seen in Barcelona

Sustainability: IoT sensors monitor resource consumption, helping cities reduce waste and energy usage by 20%, contributing to global sustainability efforts.

Public Safety and Quality of Life: Implementing real-time monitoring and emergency systems has improved public safety and reduced response times by as much as 40% in major cities.

Economic Growth: Cities that adopt smart technologies tend to attract tech-driven industries, generate job opportunities, and position themselves as innovation hubs, as demonstrated by Singapore and Amsterdam.

Recommendations

- [ ] **Expand smart waste management citywide:**

  The sensor-equipped bins trial in Warners Bay shows promise. Expanding this system across Lake Macquarie could reduce waste collection costs, optimise routes, and contribute to sustainability goals. The San Francisco model is an example, with a 20% cost reduction after implementing smart waste management systems.

- [ ] **Invest in IoT-Based public safety solutions:**

  Expanding IoT-based public safety systems, including smart surveillance and real-time emergency response systems, could improve public safety and reduce emergency response times. This approach has proven successful in New York, where response times were reduced by 25% through IoT-powered solutions.

- [ ] **Increase environmental monitoring:**

  Deploying IoT sensors to monitor air quality, water usage, and pollution levels would contribute to Lake Macquarie's environmental goals. Similar efforts in Copenhagen have resulted in a 10-20% improvement in energy efficiency, which could be replicated in Lake Macquarie.

- [ ] **Develop a comprehensive smart city strategy:**

  A clear Smart City Strategic Plan would outline goals, timelines, and investments in IoT technologies across all urban services, ensuring that smart technologies are implemented efficiently and cohesively throughout the city.

- [ ] **Collaborate with global smart city networks:**

  Leveraging Lake Macquarie's membership in the Smart Cities Council, the city could collaborate with other smart cities, such as Barcelona or Singapore, to exchange insights, best practices, and technology partnerships. These collaborations can help Lake Macquarie accelerate the adoption of IoT technologies and attract new investment.

Lake Macquarie's smart city initiatives, including the sensor-equipped bins trial in Warners Bay, represent a solid foundation for expanding IoT-powered solutions across the region. However, to fully realise the benefits of smart city technologies, the city must address gaps in waste management, public safety, and environmental monitoring. By expanding its IoT infrastructure, Lake Macquarie can improve urban efficiency, enhance sustainability, and position itself as a leader in smart city development. These investments will attract high-tech industries and ensure the city remains competitive and prepared for future growth.

Data Sources:

- Lake Macquarie Smart Cities Council https://www.smartcitiescouncil.com/members/lake-macquarie-city-council
- Smart Waste Management Systems – San Francisco https://www.smartcitypress.com/smart-waste-management-in-san-francisco
- Global Smart City Trends https://www.smartcitypress.com

Target areas for advocacy and funding efforts

Lake Macquarie is well-positioned to accelerate its smart city and digital infrastructure goals. However, targeted advocacy and funding efforts will be critical to addressing identified gaps and ensuring the region capitalises on future opportunities. Partnerships with government, private sectors, and network providers can unlock significant co-contribution projects and technology trials, benefiting the region's economic and social growth.

1. Expanding broadband and mobile networks

Lake Macquarie's growing population and regional development require high-speed broadband and 5G network expansions. While some areas enjoy high-speed connectivity, outer urban suburbs such as Wyee, Cooranbong, and Morisset still face significant challenges with slower broadband speeds and inconsistent mobile network coverage. Advocacy should focus on expanding fibre-to-the-premises (FTTP) and 5G rollouts to ensure that all communities benefit from reliable digital infrastructure.

Collaboration opportunity: Partner with network providers like Telstra, Optus, and NBN Co. to explore co-contribution projects that bring faster connectivity to underserved areas. Lake Macquarie could also seek to participate in technology trials, such as 5G coverage expansion or low-orbit satellite internet trials, positioning the region as a testing ground for cutting-edge technologies.

Funding opportunity: Leverage government funding programs like the Regional Connectivity Program to support investment in digital infrastructure projects with a co-investment model between public and private stakeholders.

2. Investment in local data centre infrastructure

Lake Macquarie's reliance on data centres in Newcastle or Sydney creates latency issues. It affects service quality, particularly in healthcare, education, and advanced manufacturing industries. Advocacy should focus on securing investments to develop local data centres, improving data access, latency, and security, and supporting Lake Macquarie's smart city goals. Given the rising importance of data sovereignty, attracting investments for sovereign data centre facilities that comply with Australian data protection laws will be vital.

Collaboration opportunity: Lake Macquarie could engage with data centre providers like NextDC or Equinix to explore joint investment projects. It could also collaborate with cloud service providers like Amazon Web Services (AWS) or Microsoft Azure to set up local edge computing facilities, enabling faster data processing for IoT and smart city applications.

Funding opportunity: Explore grants from the Federal Government's Digital Economy Strategy and public-private partnerships to finance new data centre infrastructure. Collaborations with global technology companies could also open opportunities for co-investment.

3. Scaling smart city and IoT solutions

Lake Macquarie's efforts to integrate IoT technologies—such as smart lighting and the sensor-equipped bins trial in Warners Bay—have shown promising results. However, significant scope exists to scale these initiatives across the entire region, especially in public safety technologies, environmental monitoring, and citywide waste management systems. Expanding IoT-driven solutions in these areas will enhance operational efficiency, reduce costs, and improve the quality of life for residents.

Collaboration opportunity: Lake Macquarie could partner with network providers and IoT companies to trial new smart technologies. For instance, partnerships with companies like Cisco or Siemens could facilitate trials for smart surveillance and real-time public safety systems. Lake Macquarie can access the latest innovations and share risk with private partners by positioning itself as a hub for technology trials.

Funding opportunity: Apply for grants under the Smart Cities and Suburbs Program or similar government innovation funds to support the scaling of smart city projects. Collaborative efforts with global technology leaders could bring technical expertise and financial resources to expand these systems efficiently.

4. Enhancing digital literacy programs

The Australian Digital Inclusion Index (ADII) reveals that older residents, low-income households, and those in outer urban areas are often left behind due to lower levels of digital literacy. Expanding targeted digital literacy programs ensures that all residents can participate in Lake Macquarie's growing digital economy. Programs that teach essential skills such as navigating telehealth, cybersecurity, and online services are critical for social inclusion.

Collaboration opportunity: Work with local M.P.s to deliver digital literacy workshops during events like the Seniors Week Expos. Additionally, explore partnerships with tech companies and NGOs to provide resources, tools, and funding for community workshops focused on digital literacy and safe online practices.

Funding opportunity: Secure funding through the Be Connected Program or similar government initiatives that support digital literacy efforts for seniors and disadvantaged groups. Co-investment from technology providers can further enhance the delivery of these programs.

5. Exploring co-contribution projects and technology trials

Lake Macquarie should actively explore co-contribution projects with network providers, IoT manufacturers, and data centre operators to ensure the region stays at the forefront of technological innovation. Co-contribution models, where public and private sectors share the costs and benefits of infrastructure projects, can accelerate development while reducing the financial burden on local government. Additionally, participating in technology trials allows Lake Macquarie to access cutting-edge innovations and be seen as a leader in smart city technologies.

Collaboration opportunity: Engage Telstra, Optus, and NBN Co. for co-investment in expanding broadband and mobile networks through shared infrastructure projects. Participating in 5G trials or exploring partnerships with SpaceX's Starlink for satellite internet solutions could position Lake Macquarie as a leader in digital innovation.

Funding opportunity: Use government initiatives such as the Innovative Regions Program and Smart Cities grants to secure additional funding for these technology trials and co-contribution projects.

Lake Macquarie is well-positioned to become a leader in smart city technologies and digital transformation. By targeting advocacy and funding efforts in areas such as broadband expansion, data centre development, smart city scaling, and digital literacy, the region can address its infrastructure gaps while unlocking opportunities for economic growth and improved urban services. Collaborative efforts, including co-contribution projects and technology trials with private sector partners, will further accelerate Lake Macquarie's smart city ambitions and ensure a more sustainable, connected, and inclusive future.

Examples of key sources for funding and collaboration opportunities

Below are examples of current programs, though many other opportunities are available. To stay informed about newly announced government programs and potential grant opportunities, it's highly recommended that Danita regularly checks updates through her existing Grant Guru subscription.

- Regional Connectivity Program: Supports investment in regional digital infrastructure.
- Smart Cities and Suburbs Program: Provides funding for smart technology initiatives.
- Be Connected Program: Offers resources for improving digital literacy among older Australians.
- Public-Private Partnership Opportunities: Collaborate with network and technology providers like Telstra, Optus, Cisco, Servers Australia and NextDC to co-invest in smart infrastructure.

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