Overview of the Government Chief Digital Officer feedback

The Government Chief Digital Officer (GCDO) has a system lead role for digital government and digital transformation across the public service, providing a better and more inclusive service for all New Zealanders. The GCDO focuses on what people need from government in these fast-changing times and how we can meet their needs using emerging technologies, data and changes to government culture, practices and processes.

The GCDO strongly supports InfraCom's intention to pursue a longer term (30 year) approach to infrastructure investment as expressed in their discussion paper *Developing an Enduring National Infrastructure Plan*[1] (discussion paper) to ensure New Zealand has the 'right infrastructure in the right place at the right time'.

We believe there is a common goal in between the desired outcomes of digital transformation and physical infrastructure planning, to better serve New Zealanders. There is also a dependency and interrelationship with a future National Infrastructure Plan (the Plan) in its goals of inclusivity, stimulating growth and better service provision.

It is helpful to see the reference in the consultation document to 'technology' as one of the eight drivers of infrastructure – but we suggest its current and possible role is under-represented. We believe digital transformation should be an important element in the Plan, in particular:

- That the implementation of the Plan should consider the role of:
    - Physical infrastructure in supporting digital transformation and connectivity between people, companies and government, including Digital Public Infrastructure.
    - Integration of digital thinking into the Plan with the potential to improve decision-making, and drive opportunity and benefits in the development, management and maintenance of physical infrastructure.
- That the skills and knowledge required to execute the Plan should include digital skills at a sufficient level to maximise these opportunities.

The document *Preparing for Technological Change in the Infrastructure Sector*[2] written for InfraCom by BECA and Polis Consulting in 2021, outlined several synergies between physical infrastructure and digital technology. Some of these themes are discussed further in our feedback.

Given the interrelationships between infrastructure and technology it would be useful to see a more obvious focus on future technologies in the consultation document, particularly given the 30 year timeframe. We understand the immediate need for the plan to remain grounded in large scale physical infrastructure, yet we believe it is also appropriate for the Plan to focus on the opportunities in digital transformation.

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[1] https://tewaihanga.govt.nz/national-infrastructure-plan/discussion-document

[2] https://media.umbraco.io/te-waihanga-30-year-strategy/mdjdx1pd/preparing-for-technological-change-in-the-infrastructure-sector.pdf

It is useful to note, as the consultation document does, that many technologies that are now driving our economies, interactions and communications were not available 30 years ago, and some of the most recent have genuine transformational power for the future. This emergent technology presents challenges and opportunities.

For instance, it would be good to see mention of 'Smart City/Smart Nation' as a component of the aspiration even it is at early phase. The public will have growing expectations that New Zealand will have modern infrastructure that utilises 'smart technology'. If we are not planning for this we are likely to miss significant opportunities from emergent technology.

The Plan should also consider further digitisation to drive higher productivity in the infrastructure sector:

- Digital technology can help to optimise spending to reduce the impact on the public purse, by planning effectively, helping to scale high-cost infrastructure projects, reducing the level of infrastructure required, and increasing digital engagement.
- Digital transformation creates opportunities for private NZ companies to establish and grow innovative infrastructure services in partnership with government, and to increase job growth in areas such as the digital engineering of infrastructure solutions.
- The power of big data, Internet of Things (IoT), and the creative use of AI in areas such as Digital Twinning, rapid responses, infrastructure maintenance and the automated aggregation of information have significant benefits, and can result in as much as a 6:1 return on investment.

Key themes

The Plan should consider digital transformation in physical infrastructure supporting digital transformation and connectivity between people, companies and government.

Technology could/should play an increasingly important role in critical national infrastructure and this need to be reflected. This includes technological infrastructure such as telecommunications, data centres, and the international connectivity required to support it. Some of this should be defined as 'traditional critical national infrastructure'.

This is critical to improve the digital relationship between people, government and businesses, and support. Digital Public Infrastructure (DPI), recently defined by the OECD as "shared digital systems that are secure and interoperable and that can support the inclusive delivery of and access to public and private services at societal scale",[3] can support people's digital engagement with government. This approach comes with significant opportunities for better service and reduced costs to serve, as well as enabling economic growth and the future development of next-generation services and products.

The required investment in the storage and processing of data is both an opportunity for growth in, and a risk to, power infrastructure

The consultation document indicates that energy supply needs have been well planned and controlled, however power companies have not been incentivised to expand the production capability of the network, and this is a risk for digital growth.

With the acceleration of data-hungry technologies and increased customer expectations, data use is growing exponentially. Data's worldwide needs in 2022 were about 2% and are estimated to be 4% of all energy use in 2026.[4] In tech-enabled countries such as Ireland and the USA, big data is responsible for a third of national power consumption.

Currently most data processing happens offshore, but there are risks. Our geographical remoteness adds to processing times, and we have a dependencies/risks on submarine cables for connection to international data storage, and the continued capacity in and availability of offshore datacentres.

There have been moves to set up datacentres in New Zealand and there are benefits to this. Datacentres consume local power and services, pay local taxes, employ local people and stimulate local growth. However, progress from plans to physical infrastructure has been slow, for reasons including power costs, local planning issues, and commercial agreements. They need the right economic, regulatory and infrastructure. In particular, datacentres require consistent, secure, and future-guaranteed power.

[3] This paper is not yet publicly released.

[4] https://iea.blob.core.windows.net/assets/6b2fd954-2017-408e-bf08-952fdd62118a/Electricity2024-Analysisandforecastto2026.pdf

At some point we may need to consider a joined-up energy/data strategy for New Zealand that encourages investment in NZ datacentres as well as the necessary energy infrastructure to power them. For instance, a common strategy could see co-location with renewable energy generation sources.[5]

The requirement for fast, secure transmission of information will continue to increase, which will keep pressure on communications infrastructure

The GCDO's vision is that all New Zealanders have access to the services required, including high-speed / affordable internet and the endpoint devices needed to connect with government. This includes mobile and satellite communications, particularly for outlying areas of New Zealand, marae and small local communities. We would like to see a focus on continued investment in communication infrastructure in the Plan.

Most New Zealanders' information is currently stored in cloud services, largely offshore, through companies such as Meta, Google, Microsoft or Amazon Web Services. While edge computing and IoT technologies are growth areas, the demand for communication to the international cloud is likely to continue to increase at a high rate. The network will require a constant review and upgrade of infrastructure to ensure that it will remain fit for purpose.

It is likely, for instance, that we may need additional submarine cables for the speedy and effective transmission of information to and from international locations. Choices about where these cables land in New Zealand have implications for security, infrastructure, and local data connections, and may impact decisions about where to build other related or non-related infrastructure.

The Plan should consider that better digital and data use drives change, opportunity and benefits in the planning, development, management and maintenance of physical infrastructure.

The consultation paper highlights the current gap between the costs of future infrastructure and the available funding. We would like to see an assessment of, and focus on, how changing digital behaviours will impact and potentially reduce the required level of investment in physical infrastructure.

For instance, there is significant potential that may accrue from using smart search tools to aggregate otherwise difficult-to-access and fragmentary information into usable planning datasets, in the better use of IoT and AI to move infrastructure maintenance to a "just in time" model, and in the AI modelling and optimisation of infrastructure planning.

The impact of digital presence on traditional infrastructure requirements

The concept of physical presence being "necessary" has been eroded by a combination of circumstances (particularly Covid) and enabled by the growth in the use of digital technology as an alternative, i.e. "digital presence". Digital presence also has the potential to reduce the burden on schools, hospitals and workplaces.

[5] Eg https://omny.fm/shows/the-business-of-tech/rod-drury-on-his-post-xero-life-as-nzs-fixer

- Home working in the wider New Zealand workforce: A third of all employees nationally worked from home for at least part of the third quarter of 2024, and a quarter of those worked exclusively from home.[6] Many international companies allow New Zealanders to work remotely. Home-based roles require the exchange of large volumes of data both within New Zealand and abroad.
- Remote support: For instance, smart products and wearables can monitor medical conditions without hospital attendance, and remote assessments have been used actively since Covid.
- Remote management: IoT technologies reduce the need for people carry out certain tasks in person. For individuals this means not needing to be present to turn the lights on at a house. At an industrial level, embedded smart sensors can take the place of inspections.

These technologies increase the impact and demands on digital communications and data storage but can reduce the level of necessary investment in other forms of infrastructure such as large-scale transport solutions and construction.

IoT to analyse, assess and prioritise and maintain physical infrastructure

Technology could and should play a greater role in the oversight and maintenance of national infrastructure to more efficiently monitor its performance. The IoT introduces opportunities for smart technology at any endpoint. Digital connectivity allows us to better monitor, track and understand the need for digital investment and maintenance, for instance in:

- Tracking transport usage and adjusting local roading to immediate needs
- Tracking freight usage
- Monitoring wear and tear on roads, buildings, infrastructure, pipes, etc
- Tracking water pipe flows, soil saturation levels and areas of stress
- Understanding waste management needs
- Automation of building maintenance, management, and support (Building Information Management or BIM)
- Tracking soil subsidence and movement

Much of this usable 'real time data' already exists, as do the analytical tools to utilise it and react to it using predictive "Just In Time" maintenance models, where we are able to monitor, predict failure points and intervene appropriately. When combined with payment systems, this enables real-time billing for Road User Charges, water use, and waste disposal which would support the alternative payment models in the consultation document.

[6] https://www.stats.govt.nz/assets/Uploads/Labour-market-statistics/Labour-market-statistics-September-2024-quarter/Download-data/Work-from-home-statistics-september-2024-quarter.pdf

The role of AI, machine learning and Digital Twinning in planning, testing and implementing infrastructure decisions has potential to optimise investment

When combined with data driven decision making from movement and activity data, IoT supports AI modelling and machine learning (eg "Digital Twinning"[7]) to plan networks and infrastructure, particularly in areas such as transport scenario modelling and capacity planning. This will allow us to optimise future infrastructure investment.

A national digital twin for infrastructure is not yet funded. We note that this has previously been recommended by InfraCom, and evidence from organisations such as Digital Built Britain (CDBB) suggests the approach can deliver a significant return on investment in cost avoidance. These technologies require significant access to data availability, and the use of AI will significantly speed up these processing tasks.

The need for accurate, usable data is a key fundamental, and AI can help

We note that in the light of the above, data and analytical tools can be used considerably more to guide better (data driven) decisions – and this could be highlighted in the Plan.

We agree with the need for common data standards and more public accessibility of data through APIs to better allow for system-level planning. We also note that efforts are under way to build consistency in e.g. asset standards and building libraries of APIs and connectivity. We are starting to see some results from this.

As one example, the consultation document raises concerns in the lack of public availability of school data. This is held in a common central platform owned by MoE. With an appropriate data sharing agreement in place AI tools could aggregate otherwise inaccessible data. Indeed, in some cases due to the level of complexity, granularity and obscurity of some data sources they may *only* be accessible with through the intervention of AI.

Training and resourcing requirements should include training for digital technologists

If digital transformation is a key element in the development of an infrastructure plan, digital skills and competencies need to form part of the training and capability plan. This is not reflected in the consultation document.

We expect that at least 10% of New Zealand's jobs in 2032 will be related to digital technology, AI and digital engineering. If we are to optimise our planning, maintenance and iterative improvement of our infrastructure these jobs will be needed, and the Plan should address the need to grow this capability.

[7] https://infrastructure.org.nz/towards-a-national-digital-twin-enabling-productivity-gains-for-new-zealand/

Responses to specific questions

These responses are provided for completeness, although we note that these points have already been covered in our general feedback.

What are the most critical infrastructure challenges that the National Infrastructure Plan needs to address over the next 30 years?

With regards to digital transformation, the key challenges are:

- Data, whether this is in the storage of data in datacentres, integrating data across multiple touchpoints, developing full-system models, the ability to process large amounts of data from IoT endpoints and AI information crawling.
- Power, particularly the power required to process large scale modelling and data storage.
- Maintain and improve affordable connectivity: offshore, onshore, local, mobile, satellite. Make everyone part of a Digital Nation.
- Security and robustness, particularly of national assets.

What are the main sources of uncertainty in infrastructure planning, and how could they be addressed when considering new capital investments?

- The role of digital presence and its likely impact on traditional infrastructure.
- Emergent technology has the power to transform how/what we plan, build and manage infrastructure.
- A guaranteed, scalable, green energy supply that can be used to support the planned data explosion.

Are we focusing on the right problems, and are there others we should consider?

- Digital transformation is significantly underrepresented in the plan and has the potential to affect every part of physical infrastructure, from alternative funding, to maintenance budgeting, to optimising the build process.

What changes would enable better infrastructure investment decisions by central and local government?

- Significantly greater use of data and technology in every aspect of the planning, decision making, implementation, and monitoring of infrastructure. There are significant data sets available now that we are not utilising effectively, and unrealised potential in maximising the use of those datasets.

How should we think about balancing competing investment needs when there is not enough money to build everything?

- Use additional tools to help better plan and organise infrastructure spending, eg:
    - Use digital modelling to prioritise what is really needed.
    - Use IoT technologies to plan and prioritise maintenance.

- Investing in digital infrastructure may be an alternative to investing in physical infrastructure. As Government moves services into a digital mode and makes digital identity, the need for physical presence is reduced.

How can we improve leadership in public infrastructure projects to make sure they're well planned and delivered? What's stopping us from doing this?
How can we build a more capable and diverse infrastructure workforce that draws on all of New Zealand's talent?

- Bring in leaders who understand the benefits and opportunities in digital planning design and management. This requires a medium-term plan to train and develop the capability, but it also requires a cultural shift in many cases to trust the technology.

What approaches could be used to get better value from our infrastructure dollar? What's stopping us from doing this?

- Use digital technology to optimise planning and spending, particularly modelling, data analytics and reporting. Bring systems into line with each other, with common platforms and standards.
- See investment in digital infrastructure as an option to reduce investment in physical infrastructure, and model this as a possible outcome.
- Implement Just in Time maintenance using smart monitoring wherever possible.

How can we lower carbon emissions from providing and using infrastructure? What's stopping us from doing this?

- Several opportunities around digital presence and IoT which means fewer journeys, lower running costs for smart buildings, better planned infrastructure. Alongside enabling policy direction, investment in digital infrastructure is an option to reduce carbon emissions.

How can best practice network pricing be used to provide better infrastructure outcomes?

- IoT with peer-to-peer payment gives the opportunity to implement a "pay per use" real time model based on individuals, companies and organisations.