



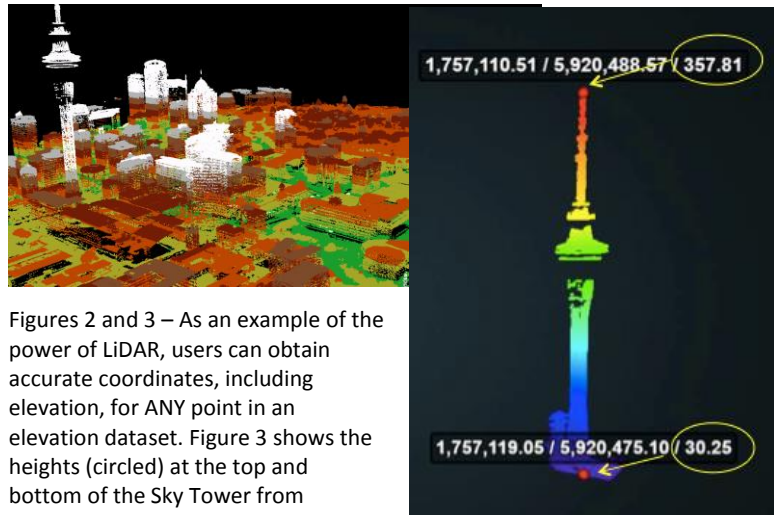
Application for Funding

This application form will help the officials administering the Fund to make a decision on your proposal, so please provide as much detail as you are able to, as appropriate to the size and complexity of your proposal. If information required in this form is missing, officials will contact you to ask for that, which will add time to your application process.

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| Proposal Name | Better elevation data infrastructure for regional growth |
| Applicants and contact details | <p>Land Information New Zealand</p> <p>Contacts: Jan Pierce, DCE Location Information, jpierce@linz.govt.nz, DDI 04 498 3840</p> <p>Roger Carman, Group Manager Topography, rcarman@linz.govt.nz, DDI 04 471 6336</p> |
| <p>Summary of project <i>Include an overview of:</i></p> <ul style="list-style-type: none"> • <i>The proposal for which funding is sought</i> • <i>The amount of funding being sought</i> • <i>Details of all contributors to the proposal and engaged stakeholders</i> • <i>What the proposal is seeking to achieve</i> • <i>A summary of other sections of the business case</i> | <p>Proposal to improve elevation data infrastructure for growth</p> <p>This proposal seeks funding for coordinated capture of provincial elevation data to support regional growth and resilience. The result will be a nationally consistent and open dataset covering the majority of New Zealand. It will be used by regional businesses and government for a range of high-value activities.</p> <p>Land Information New Zealand (LINZ) will administer and coordinate the initiative over a three or five-year period, working with surge and other regions prioritised by opportunity and regional engagement.</p> <p>With or without this proposal, regions will request co-funding from the Provincial Growth Fund (PGF) to improve their elevation data. This proposal is the most efficient way to administer requests, encourage uptake and ensure the benefits from government investment are maximised to all stakeholders.</p> <p>Elevation data is a foundational data asset</p> <p>High-quality elevation data is an enabling infrastructure that allows us to accurately map and digitally recreate our physical world, both built and natural. It is a foundational data asset essential to decisions involving the physical world, with the potential to help drive regional economic growth and spur new investment across the country.</p> <p>Elevation data is captured through Light Detection and Ranging (LiDAR), a technology that uses aircraft-mounted laser instruments to measure distances to features on the ground (Figure 1). The result is a highly accurate dataset measuring ground terrain and above-ground features such as buildings (Figure 2) and vegetation.</p> |



Figure 1 – LiDAR-based elevation data (right) provides a tenfold increase in accuracy compared to New Zealand’s current national dataset, which is based on topographic map contours. This improved accuracy is required for a number of applications, including evaluating flood risk or measuring slope when planning forestry operations.



Figures 2 and 3 – As an example of the power of LiDAR, users can obtain accurate coordinates, including elevation, for ANY point in an elevation dataset. Figure 3 shows the heights (circled) at the top and bottom of the Sky Tower from Auckland Council data accessible through the LINZ Data Service.

Smarter investments and improved resilience

Funding from the PGF for high-quality data will support increased investments that are better informed, more efficient and resilient to environmental impacts and hazards.

The priority is on regions where these improvements might not otherwise occur because funding elevation data is not affordable. Specifically, it will allow:

- forestry industry stakeholders to better plan and invest in planting operations
- local government agencies to strengthen resilience of New Zealand’s built environments through an increased understanding of the impacts climate change and natural hazards will have on

communities

- infrastructure providers to model the impacts of multiple natural hazard and weather scenarios on physical infrastructure, and save money and time through smarter planning
- productivity improvements and savings in the agricultural sector through increased efficiencies in resource uses such as fertilisers and irrigation, and reduced compliance costs for environmental regulations.

Proposing three-year or five-year options

LINZ proposes either three-year or five-year funding options for this initiative:

- **Commercial Information**
[Redacted]
- For a five-year option, we would seek up to \$^{Commercial} to fund coverage over nearly all of provincial New Zealand.
- Under both options, we would seek local and regional government contributions of ^{Commercial} % of total costs to ensure regions have a legitimate business need and ‘skin in the game’.
- LINZ would provide up to \$^{Co-merc} of in-kind operational support on top of the funding sought from the PGF to offset some of the increase in internal costs.
- Funding requested can be dependent upon local government participation and co-funding. If this is less than anticipated once the initiative begins, the requested amount can be reduced accordingly.

Management and procurement approach

It is critical that regions see enough value from elevation data to provide co-funding and take the lead on procurements for their regions. This will maximise the chances of data being used for high-value activities.

LINZ proposes to support regions through coordinating and leading at the national level. This will increase speed of acquisition by providing certainty to vendors (allowing them to invest in capacity), and reduce the risk of weather delay through spreading work amongst different geographic regions. The above is important because of the significant constraints in the domestic market for LiDAR providers, which could result in project delays and higher costs if not managed carefully.

LINZ role

LINZ proposes to:

- administer funding on behalf of the PGF as an ‘enabling infrastructure initiative’
- work with individual regions to design and negotiate an approach that makes sense for them
- support coordinated procurement across participating regions

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| | <p>with the limited number of suppliers</p> <ul style="list-style-type: none">• ensure the data captured is accurate and comprehensive• manage data and distribution for open reuse to enable further innovation and value• support capability-building and greater awareness to ensure regions use the data to create maximum value. <p>Leveraging LINZ's strong track record</p> <p>LINZ is uniquely positioned to lead here because of our track record in managing partnerships with local and central government, and providing open data access with unrestricted distribution via the LINZ Data Service to industry, government and the general public:</p> <ul style="list-style-type: none">• Our programme for coordinated capture of aerial photography is viewed as a success by local government partners and participating central government agencies. Partners use the imagery regularly for requirements such as issuing consents or providing context for planning.• We manage a highly successful partnership initiative with 12 regional councils to co-fund digitisation of New Zealand's archive of historical aerial photos. Councils regularly use the output in land use management and for decisions in areas such as identification of contaminated land and monitoring coastal erosion.• We have already piloted a national elevation improvement programme, which has developed a scalable framework for working with councils to ensure that elevation data captured for their needs also benefits central government and industries. <p>Under this pilot, we have supported Northland and Tairāwhiti/East Coast to successfully bid for government co-funding of improved elevation data. The data is needed for effective land use management, development and growth.</p> <p>This proposal will enable the PGF to leverage the momentum LINZ has built over the last three years with the elevation pilot, while overcoming the current situation where, due to the high cost of elevation data, councils are limited in what they can afford. While LINZ has invested in the pilot activities to build a scalable programme, there is no funding in Vote: Lands for co-funding data procurement.</p> <p>Engagement and support for funding elevation data</p> <p>Through the three initiatives noted above (and others), LINZ has developed strong relationships and engagement with other government agencies and industry:</p> <ul style="list-style-type: none">• We actively engage with the Local Government Geospatial Alliance and the Association of Local Government Information Management so we stay attuned on providing the best services.• LINZ also hosts semi-annual briefings for the private sector on our work in the interest of ensuring 'no surprises' and synergy. |
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Councils and other government agencies are encouraging LINZ to seek central government co-funding for elevation data partnerships. We act as an 'honest broker' ensuring maximum system benefit for New Zealand through offering open access to nationally consistent, high-quality elevation data.

During the elevation pilot, LINZ has gained formal support for improving this data from 20 organisations, and has worked with councils to provide high accuracy elevation data for more than 20% of New Zealand (Figure 4). LINZ is also actively working with the Hawke's Bay, Marlborough, Southland, and West Coast councils, which have expressed interest in data capture in their regions.

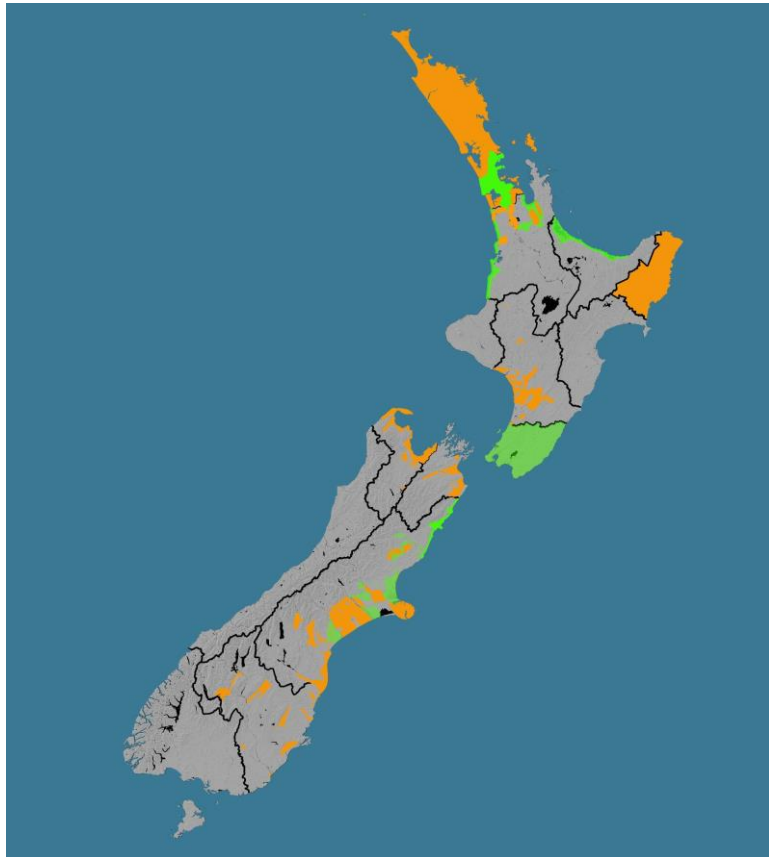


Figure 4 – LINZ's elevation pilot has opened access to high-quality data for the areas in green, while the orange areas are in progress. The main centres tend to be well covered, while provincial coverage is sparse. This proposal will assist with expanding capture to the regions where affordability is a barrier.

Costs and Benefits of the Project

NB: The proposal includes two options (three-years and five-years). Because of capacity constraints on existing suppliers there are limits as to how much capture can be done in a single year, even with sufficient funding.

However, the ability to increase scale is not linear. If we can provide greater demand over a longer time-frame, we expect suppliers will be incentivised to bring more equipment to New Zealand. Hence, with a five-year horizon we can do somewhat more in ‘years two and three’ than we could with a three-year horizon.

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| <p>What is the total cost of the project</p> | <p>This proposal includes two options:</p> <ul style="list-style-type: none"> • Three-year option: \$^{Commercial Infor} • Five-year option: \$^{Commercial Infor} <p>The cost is based on a data cost of \$^{Commercial} per square kilometre (from LINZ’s experience with regional scale LiDAR projects) over the provincial areas currently lacking precise elevation data and prioritised by councils.</p> | |
| <p>What is your (the applicant’s) financial contribution?</p> | <p>Three-year option: \$^{Commercial In}</p> <p>Five-year option: \$^{Commercial In}</p> <p>LINZ’s contribution is for in-kind support for staff and data management infrastructure.</p> <p>Recurring data management support beyond the project will also be provided by LINZ, estimated at \$^{Commercial} p.a.</p> | |
| <p>What Government funding is being sought</p> | <p>Three-year option: \$^{Commercial In}</p> <p>Five-year option: \$^{Commercial Infor}</p> <p>Under both options, ^{Comm}% would go directly to the regions for procurement costs, and LINZ would retain ^{Cor}% to partially off-set the currently unfunded costs of coordinating the initiative (including procurement), providing technical support and data management.</p> | |
| <p>Breakdown of other funders</p> | <p><i>Contributor</i></p> | <p><i>Amount (\$)</i></p> |
| | <p>Local government agencies:</p> | <p>Three-year option: \$^{Commercial In}</p> |
| | | <p>Five-year option: \$^{Commercial In}</p> |
| | <p>NB: The initiative will operate on a cost-sharing basis to ensure councils remain engaged and have buy-in to the process. Amounts will be recommended by a governance group, taking into consideration local rating bases compared to the area of coverage required.</p> <p>We expect that contributions to data procurement will be 10-40% and will average to about 25%. This does not include in-kind staff-time contributions from councils, which we have not estimated.</p> | |

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| <p>Benefits of the project</p> <p><i>Identify and, if possible, quantify the economic benefits from the project. In particular, highlight public benefits (i.e. benefits other than increase profitability of the applicant)</i></p> <p>NB: Elevation data is enabling infrastructure that supports better, faster and more confident decision-making across a wide range of private and public sector activities.</p> <p>As with all open data, the way this will occur is highly dispersed and not fully predictable.</p> <p>While LINZ cannot be certain that any particular organisation will use the data in a particular way, we know there is value here that easily exceeds the costs. To do this, we draw on studies that point to the value of this data on average, as well as reflect the experience of those that have demonstrated value from this data where it is already available.</p> | <p>Forestry industry benefits</p> <p>Accurate elevation data can enhance the forestry industry through the following:</p> <ul style="list-style-type: none"> • <i>It unlocks regional investment in forestry</i> through providing accurate terrain information that reduces planning costs and provides greater certainty for operations such as planting, building access roads and harvesting. <p>Forestry companies use elevation data for feasibility studies on investments in future planting sites. The West Coast Regional Council, Marlborough District Council and Tairāwhiti-East Coast have all expressed the need for accurate elevation data to plan new forest planting.</p> <ul style="list-style-type: none"> • <i>It enables improved forestry productivity and reduced compliance costs.</i> Elevation data would allow industry players to better predict soil erosion and sedimentation during planting and harvest, and plan accordingly for mitigation and reduced environmental impacts. West Coast Regional Council has cited this as, potentially, a key driver for improved environmental outcomes and regional development, and this is an expectation of the newly released National Environmental Standards for Plantation Forestry. • <i>It can be used in volume estimations.</i> Scion Research has cited an accurate elevation model of the ground as essential to applying other technologies that measure plantation volumes more cost effectively. • <i>Larger forestry companies collect LiDAR to use in precision forestry and enable cost-savings. Only 12% of forest owners operate at the scale that makes this data economic.</i> Investing through the PGF will open access to LiDAR to: <ul style="list-style-type: none"> ○ smaller companies and those entering the market through the One Billion Trees Programme ○ Government, including agencies monitoring forest carbon and conservation. <p>Making regional development resilient</p> <ul style="list-style-type: none"> • <i>Regional industries can make better informed decisions on the risks from natural hazards.</i> Primary industries such as dairying face prolonged economic disruption and reduced productivity from floods and landslides. This data will strengthen the ability for industries to predict effects and takes steps to mitigate their impacts. • <i>It enables modelling of future trends such as soil erosion and terrain changes.</i> Elevation data will help primary industries such as horticulture understand the effects of current practices and plan for projected changes. • <i>Improved elevation data is a key input into hazard modelling that enables better planning and response by councils,</i> |
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| | <p>particularly for floods, landslides, coastal inundation, and sea-level rise. Accurate risk assessment informs better decisions around mitigations and adaptations such as building defences, response plans, insurance underwriting, and secure resilience.</p> <p>Based on a business case for a proposed Local Government Risk Agency, elevation data enables reduced costs to local government from hazards of \$6-\$11M p.a.</p> <ul style="list-style-type: none"> • <i>Elevation data pre-event is essential to understanding the scale and scope of impacts from natural events.</i> Elevation data was used in Christchurch to help quantify changes to the landscape in order to estimate tectonic movements and liquefaction (DPMC Report 2017, <i>Lessons from the Canterbury earthquake sequence</i>). <p>Infrastructure planning and provisioning</p> <ul style="list-style-type: none"> • Elevation data allows for <i>faster and improved planning on infrastructure</i> such as roading and transport routes. It also reduces the overall costs of infrastructure planning. <p>Overall these savings have been estimated at around 1% of the overall cost of infrastructure projects. For this reason, data is often procured for projects as a one-off.</p> <ul style="list-style-type: none"> • <i>It allows planners to predict the effects of natural hazards</i> such as floods and landslides, and projected trends such as sea-level rise and soil erosion. This can be used to consider future infrastructure adaptations and mitigation options such as building coastal defences or changing transport routes. <p>In Auckland, stormwater management and planning relies heavily on elevation data to map floodplains, predict overflow paths and determine where to place or upgrade physical assets. A business case for the Auckland region presented potential savings of \$5M in storm water management alone.</p> <ul style="list-style-type: none"> • <i>It allows lifeline utilities to model predicted physical trends and identify potential risks from natural hazards</i> such as landslides, earthquakes or floods. Lifeline utilities are critical pieces of infrastructure that provide essential services such as wastewater, energy, communications and transport. <p>Increased regional productivity and reduced costs</p> <ul style="list-style-type: none"> • <i>Agricultural sector compliance costs can be reduced.</i> Elevation data can help farmers increase productivity through better decisions around land use and stocking, leading to increases in production and/or production cost-savings. • <i>Elevation data can also improve fertiliser and irrigation efficiency.</i> This can reduce compliance costs and improve modelling for the environmental impacts of nitrogen and effluent runoff into the wider environment. • <i>It has the potential to improve pest control by mapping</i> |
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| | <p><i>habitats.</i></p> <ul style="list-style-type: none">• <i>This data is a fundamental input into mapping soil and ecosystems for environmental planning.</i> For example, Auckland has been able to develop a high-resolution soil map for environmental planners to improve decision-making in Franklin. <p>Multi-purpose asset</p> <p>Just some other examples of the wide range of applications for elevation data include:</p> <ul style="list-style-type: none">• 3D mapping to optimise investment decisions by resource owners/users, including Māori facing post-Treaty-settlement land use decisions, engaging with the Crown on the One Billion Trees Programme, and planning lucrative and high-value agricultural ventures• improved regional spatial planning of infrastructure, housing and regional economic development• technological innovations from data reuse. <p>More generally, open data drives further technological innovations due to reduced acquisition costs. It has the potential to improve a range of services and products in the geographic information services (GIS), architecture, engineering, transport, entertainment, and other sectors.</p> <p>For example, CloudRF, an online radio planning service, uses Christchurch elevation data in its premium radio wave propagation service, while architectural and engineering companies regularly download the data available from the LINZ Data Service.</p> <p>In 2012, U.S. company Dewberry published the National Enhanced Elevation Assessment report, which helped launch the current U.S. national LiDAR programme. The Dewberry report estimated benefits to GDP from \$US1.2B-\$US13B p.a. Commercial Information</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> |
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Contribution to the Fund’s Objectives/Additionality

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| <p>What are the key objectives of the proposal? <i>Include information about how the proposal will meet these objectives</i></p> | <p>The ultimate objective of this proposal is to improve regional productivity, investment and resilience through better, faster decision-making. This will be enabled by use of various industry tools underpinned by the elevation data that this initiative will deliver.</p> <p>The specific objectives to get us there are described below.</p> <p>Objective 1: Procure sub-metre elevation data to cover all of provincial New Zealand (five-year option)</p> <ul style="list-style-type: none"> • The funding sought here—combined with coordination and support from LINZ—will be sufficient to procure a fit-for-purpose nationwide dataset. LINZ experts will ensure the data meets quality standards, while local and regional government will be responsible for ensuring the data meets local needs. <p>Objective 2: Intelligent procurement</p> <ul style="list-style-type: none"> • There are a limited number of suppliers, and the expensive, niche equipment required means that scaling up activity in New Zealand is difficult. Data collection relies on clear skies, which are sometimes available in one part of New Zealand and not elsewhere. • LINZ will coordinate joint procurement across regions to ensure suppliers do not drive up prices due to limited capacity and high risk of weather delays, and that opportunities to shift data capture to where the weather is amenable are exploited (which will help suppliers as well). This will lead to cheaper, faster data collection compared to a bespoke approach. <p>Objective 3: Easy, public access to the data</p> <ul style="list-style-type: none"> • Public sharing of the data will be a condition of LINZ’s agreements with local government agencies. Our existing data infrastructure and systems will be used to make data accessible to whoever wishes to use it, for any reuse purpose. <p>Objective 4: Strong application of the data through improved capability and knowledge of its value across sectors</p> <ul style="list-style-type: none"> • LINZ has strong connections to both government and private sector geospatial user groups, and actively raises awareness and encourages uptake of existing and future datasets. As a result we are also in a position to work with these stakeholders to facilitate uptake of the data. |
| <p>What is the existing situation? <i>In relation to each of the objectives</i></p> | <p>Existing national coverage is not fit for purpose (Objective 1)</p> <ul style="list-style-type: none"> • Heights in the current national dataset are accurate to only 10m, whereas most modern users need elevation data at sub-metre—sometimes centimetre—accuracy. This outdated dataset was collected for topographic mapping purposes, but is now largely used for only low-value activities. • Much of New Zealand’s current elevation data is of insufficient |

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| | <p>quality, or is too incomplete, for local authorities to effectively use in modelling natural events such as floods or sea-level rise. For example, NIWA has noted that critical elevation data errors (measured in centimetres) can result in large inundation errors (measured in square kilometres) when modelling the risks of flood inundation.</p> <ul style="list-style-type: none"> • Many regional councils lack the rating base to purchase high-quality elevation data or effectively respond to natural events, and are often the regions that need it most for resilience planning purposes. • Currently, large forestry companies can afford to capture LiDAR, but smaller firms cannot. Prospective landowners who potentially have suitable land for forestry cannot afford elevation data either. • While LINZ has been active in coordinating procurements and seeking recent high-quality data for our elevation pilot (Figure 4), this will only provide about 20% national coverage. Cost is a significant barrier to further expanding coverage without central government funding. <p>Current procurement practices are highly inefficient (Objective 2)</p> <ul style="list-style-type: none"> • There are significant constraints in the domestic market of LiDAR providers—only two established providers that can deliver regional-scale data are currently based in New Zealand. While other local operators may scale up in the future, today’s capacity is inadequate to even meet current demand. Project delays are frequent. • International operators that can absorb the higher mobilisation costs may be attracted into New Zealand by larger-scale projects. A coordinated procurement approach, with multi-year certainty, will likely speed up data capture and result in more competitive bids, without regions competing against each other. A status quo ad-hoc approach will almost certainly result in project delays and higher costs. <p>The LINZ Data Service provides open access to data (Objective 3)</p> <ul style="list-style-type: none"> • Datasets covering the areas shown in Figure 4 are, or will be, made openly available on the LINZ Data Service. LINZ’s elevation pilot has developed a scalable process for robust open data access, and it has already fielded thousands of requests for the new elevation data. <p>Improved capability in using and benefiting from data can only come once the data is open and coverage is improved (Objective 4)</p> <ul style="list-style-type: none"> • Existing data is too incomplete to actively promote reuse. |
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| <p>What is the business need of the project? <i>The gap between the current and future state</i></p> | <p>Sub-metre accurate elevation data is needed across provincial New Zealand. This data needs be easily accessible and open licensed. Potential users need to be aware of, and capable of, using it.</p> <p>Years of experience have shown us that the private sector will not solve this, as private actors will continue to only procure data for narrow purposes and are unlikely to make it publicly available.</p> <p>Many provincial governments (particularly those with large land areas and a small ratings base) are unable to prioritise investment in elevation data against competing short-term priorities and other infrastructure needs.</p> <p>It is critical that procurement is coordinated. A bespoke approach that entails various councils all procuring data at the same time may lead to unnecessarily expensive and slow-paced data collection.</p> <p>LINZ leadership will ensure councils are negotiating in a collaborative rather than competitive manner. In addition to reducing costs, this will allow us to take advantage of things like variable weather patterns to collect data more efficiently.</p> |
| <p>How does the project contribute to the Fund's outcomes? <i>i.e. Maori development, environmental sustainability, employment outcomes, increased productivity</i></p> | <p>Sustainable economic development</p> <p><i>Facilitating new investments in regions</i></p> <ul style="list-style-type: none"> • Forestry: it provides evidence and data for prospective investors to assess suitability of regions not otherwise considered due to prohibitive costs of assessing suitability. • Land use planning: councils, landowners and investors can use elevation data to improve planning for current and future land uses. This has the potential to unlock sustainable job-creating investments and further innovation opportunities in precision agriculture, as seen internationally. • Infrastructure: it is used to plan and design major infrastructure works (e.g. a potential new SH1 between Picton and Christchurch). Savings come from better understanding of factors such as cut/fill and routing/location options and from avoiding rework associated with less precise designs. <p><i>Increasing productivity of existing industries</i></p> <ul style="list-style-type: none"> • Agriculture: this data helps farmers to increase productivity through better decisions around land use and stocking, leading to increases in production and/or production cost-savings. There are estimated savings in fertiliser costs according to Ravensdown. • Forestry: elevation data is used to model optimal design of plantation forests, enabling cost-savings for engineering works and harvesting conservatively estimated at 1%. It also enables much greater certainty and better decisions around 'inventory' (calculating the volume of wood) that is used in compliance and business planning. This data can also be used to better target pruning for increased plantation productivity. |

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| | <ul style="list-style-type: none">• Reduces compliance costs for forestry and agriculture sectors in meeting National Environmental Standards for (water) run-off and erosion. <p>Increased productivity</p> <ul style="list-style-type: none">• Elevation data is estimated to save 1% in overall costs of physical infrastructure planning and investment decisions. There is the potential to support more efficient and productive decisions on other capital investment, and savings in both time and costs. Elevation has seen these savings when used in council works programmes such as three-waters in the Whangarei Heads sewerage scheme or pipe repairs for Kaikōura. <p>Surge regions</p> <ul style="list-style-type: none">• Elevation data is of particular value for economic development in the surge regions, given forestry and agriculture are major sectors.• It is also highly relevant for hazard modelling that enables better planning and response by councils, particularly for floods, landslides, coastal inundation, and sea-level rise. The surge regions are disadvantaged when comparing their risk exposure to their ability to fund mitigation initiatives.• Northland already has an all-of-region LiDAR data capture programme in place, made possible with Regional Economic Development and LINZ support, and is not targeted for this proposal.• Tairāwhiti/East Coast has recently gained funding for all-of-region LiDAR capture by the Ministry for Primary Industries (MPI) and LINZ. This project has not yet gone out for tender and could be included in the coordinated procurement approach we are proposing.• Hawke’s Bay and West Coast are in the process of preparing business cases for LiDAR data capture and are likely to be amongst the first applicants for PGF support. <p>Climate change</p> <ul style="list-style-type: none">• Elevation is fundamental to understanding the short-term impacts from intensified extreme weather events. The Government Climate Change Working Group has identified LiDAR as a core dataset for developing nationally consistent datasets for risk and vulnerability assessments.• Elevation is also fundamental to understanding the long-term trends and predicted impacts from climate change, such as sea-level rise, changes in temperature and their impacts on our natural environment. This data improves local government’s ability to undertake mitigation and adaptation works for communities and industries. |
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| | <p>Increased resilience</p> <ul style="list-style-type: none">• Sustainable economic development will be limited if local and central government cannot plan and provision for the effects of natural hazards and events on regional industries and communities.• Elevation data is a key input into hazard modelling that enables better planning and response for primary industries such as agriculture or forestry. This feeds into better decisions around mitigations (such as building defences, response plans or insurance underwriting). This data can also be used to determine the potential vulnerability of industry activity in certain regions ahead of time.• Having high-quality evidence also improves councils' ability to predict the impacts of natural events and plan in advance, and then to mitigate costs and potential damage or loss of life. Based on a business case for a proposed Local Government Risk Agency, elevation data enables reduced costs to local government from hazards of \$<small>Commercial Information</small>• Future planning for community development can also be enhanced through elevation data to ensure that urban development is resilient to projected trends and events.• As demonstrated with the Kaikōura earthquake and tsunami events, having elevation data pre-event significantly reduces the timeframes for assessing the impacts of events on infrastructure and geography (An evaluation and lessons learned from responses to the Kaikōura earthquake, 2018).• Precise data also improves national-level hazard modelling to better understand risks and impacts, planning and response across the country. This helps improve resilience of nationwide infrastructure and reduce costs at a central government level. <p>Environmental sustainability</p> <ul style="list-style-type: none">• Elevation data can be used to improve conservation and pest control outcomes by modelling habitats and potential areas for targeted control. Areas for potential savings include the control of wilding conifers and possum infestations.• Elevation data can also help to model predicted soil erosion based on land use changes and weather patterns. This can in turn inform mitigation efforts and predict wider environmental impacts to be incorporated into compliance costs for industries.• Potential environmental impacts from fertiliser and effluent runoff can be significantly improved through elevation data. <p>Māori development</p> <ul style="list-style-type: none">• This data enables better decision-making by Māori freehold landowners realising economic returns from different activities on their land. Some iwi and hapu are exploring options for |
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| | <p>engaging with the Crown on the One Billion Trees Programme and forestry initiatives, as well as on lucrative and high-value agricultural ventures.</p> <ul style="list-style-type: none"> • Many Māori communities are in areas vulnerable to climate change (e.g. coastal, hilly) but relatively sparsely populated where bespoke data procurement is unlikely. The resilience benefits will be concentrated in these communities. |
| <p>Does your proposal support any other proposals, including any that have recently been funded, are being considered for funding, or may soon apply for funding?</p> <p><i>Explain the relationship between this and other proposals</i></p> | <p>Proposals for regional scale LiDAR data collection by councils</p> <p>Several councils are expected to apply for funding from the PGF for regional scale LiDAR data collection, for the benefits mentioned in this proposal plus others. This proposal is an approach to manage this more efficiently and effectively than dealing with proposals in isolation.</p> <p>One Billion Trees Programme</p> <p>Landowners and forestry operators, especially the smaller ones who can not afford their own data capture, will be able to use the LiDAR data to enable better decisions for planning, monitoring, and harvesting. These operators and councils will be able to use the data to better manage environmental impacts, in accordance with the National Environmental Standards for Plantation Forestry.</p> <p>Zero Carbon Act</p> <p>Elevation data helps improve the ability of government and industry to monitor and quantify carbon stock.</p> <p>The Ministry for the Environment’s website notes that LiDAR data is used in conjunction with field measurements to improve the precision of the carbon stock and stock change estimates for planted forests.</p> |

Regional Connections

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| <p>What regions are covered by your proposal? <i>Identify what region/s the proposal will benefit and how it will do this</i></p> | <p>This proposal applies to all regions in need of increased elevation data coverage to enable provincial growth. Specific prioritisation and funding commitments would be recommended by a governance group. The following is a suggested prioritisation framework that forms the basis for the cost estimates in this proposal:</p> <p>Priority 1 Commercial Information, Negotiations [Redacted] [Redacted]</p> <p>Priority 2 Commercial Information, Negotiations [Redacted] [Redacted]</p> <p>Priority 3 Commercial Information, Negotiations [Redacted] [Redacted] [Redacted] [Redacted]</p> <p>Auckland, Nelson, Northland, and Wellington already have full data coverage (or funding for full coverage) and are unlikely to seek further data capture funding through the PGF.</p> <p>These priority groups are indicative. Decisions on priority will be based on assessed opportunity and regional readiness, made by an advisory group.</p> |
| <p>What local support does your proposal have? <i>Have you discussed your proposal with local stakeholders (e.g. council, iwi/Māori groups, regional governance groups)?</i></p> <p><i>Did they support it? If not, why not?</i></p> | <p>LINZ has sought support for this proposal from regions that are most ready to initiate and co-fund regional elevation data procurement. We have discussed the proposal with Commercial Information, Negotiations [Redacted] [Redacted]</p> <p>Specifically, the regions benefit from this proposal with cost-savings for data capture, a more effective coordinated procurement approach and data hosting by LINZ to enable reuse.</p> <p>We have also discussed this proposal with MPI and MfE who agree that increased coverage of high-accuracy elevation data is in the national interest.</p> <p>The overall elevation improvement initiative has widespread support, with letters of support from the following stakeholders:</p> <p>Auckland Council, Environment Southland, Local Government Geospatial Alliance, Northland Regional Council, Wellington City Council, Department of Conservation, Earthquake Commission, Civil Aviation Authority, Ministry for Primary Industries, Ministry of Civil Defence and Emergency Management, Ministry for the Environment, New Zealand Defence Force, GNS Science, Maanaki Whenua - Landcare Research, Scion Research, Blakely Pacific (forestry),</p> |

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| | Resilient New Zealand, the Insurance Council of New Zealand, NZ Airports Association, OSPRI. |
| Are you using local governance processes? <i>i.e. existing local, regional and/or iwi/Māori governance processes</i> | LINZ is working directly with councils that will lead procurements. Local governance is left up to the individual regions, and typically is addressed amongst the stakeholders approving the local funding, which may be used for more than just the elevation data collection. The governance process LINZ proposes is for central government to ensure that funding allocations are fair, transparent and in the interest of the PGF objectives. |

Governance and Management

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| <p>What are the key milestones and outputs for the project?</p> | <p>The key milestones are:</p> <ol style="list-style-type: none"> 1. Elevation data product delivery (digital elevation models) 2. Data open access through the LINZ Data Service. <p>The key output is complete coverage over participating regions, allowing a step change in land use management and other applications that can utilise 3-D landscape data.</p> <p>The required outcome is uptake of the data for better decision-making and economic growth.</p> |
| <p>How will the project be managed and governed?</p> | <p>The overall initiative will be managed by LINZ. Individual data collection initiatives will be managed by the regional councils through a joint procurement model.</p> <p>An advisory governance group will be set up representing the PGF, MPI, Industry and possibly other relevant national government priority programmes (e.g. climate change adaptation). The group will recommend funding allocations amongst the applicants on the advice of LINZ officials.</p> <p>LINZ will undertake the day-to-day programme management using existing processes and structure.</p> |
| <p>Outline the risks of this project <i>(Including mitigations)</i></p> | <p>Data capture delay due to limited supplier capacity</p> <p>The domestic market for suppliers is currently insufficient to meet the expected increase in demand if this proposal is funded. Conversations with suppliers indicate the status quo, ad-hoc market in New Zealand makes it too uncertain to invest in increased capacity.</p> <p>A programme commitment of three years or more could lead to investment by suppliers to increase their capacity, which is a first step in reducing this risk. Further mitigation would be to accept the risk as leading to schedule over-runs in a fixed-cost environment.</p> <p>Data capture delay due to weather</p> <p>LiDAR capture is dependent on clear weather, and for safety reasons needs to be captured during daylight hours. This presents a risk as prolonged poor weather can significantly delay data capture.</p> <p>The weather delay risk would be spread by coordinating contracts so that individual companies have work across multiple geographic areas and are able to take advantage of good weather windows suitable for data capture. Further mitigation would be to accept the risk as leading to schedule over-runs in a fixed-cost environment.</p> <p>Data capture projects abandoned by suppliers prior to product delivery</p> <p>Suppliers are paid incrementally as they achieve specific milestones. Contracts will include a provision that the customer will have access to all data collected in the event a contract is terminated before completion. Contracts will be awarded based on companies' track records.</p> <p>Unclear expectations regarding data collection over Crown-owned land</p> |

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| | <p>The governance group may need to advise regarding any council proposals that request additional funding to off-set the data capture costs resulting from there being a large amount of Crown land in their region.</p> <p>Smaller than anticipated uptake by regions</p> <p>The programme will be promptly announced so councils can factor this into their long-term planning. LINZ will seek MBIEs guidance on communication channels, as well as directly targeting councils in all the regions targeted in this proposal. The funding sought is entirely for data acquisition, and would only be spent once partnership agreements are in place. Out-year funding requests can be reduced if necessary.</p> <p>Data does not improve decision-making or improve outcomes</p> <p>Councils will be required to clearly state the beneficial outcomes they seek when applying for funds, and provide evidence of improved outcomes after project completion.</p> <p>LINZ will take advantage of our strong relationships and engagement with other government agencies and industry so we stay attuned on providing the best services, and will raise awareness of this work in the interest of ‘no surprises’ and synergy.</p> |
| <p>Outline the procurement process</p> | <ol style="list-style-type: none"> 1. LINZ and MBIE announce the programme for elevation data co-funding and terms for participation. 2. Interested councils respond with streamlined applications to participate. These applications would include details about the area of interest, ability to co-fund and readiness to begin procurement. 3. Applications are screened by LINZ, and co-funding is recommended by the governance group. 4. LINZ issues a coordinated Request for Tender. The tender process is expected to take advantage of coordination amongst individual procurement contracts to seek economies of scale and minimise risks. LINZ will seek advice on collaborative procurement from MBIE’s procurement centre of excellence. 5. MOUs are established between individual councils and LINZ. 6. Contracts for services are issued by the councils to aerial survey providers. 7. Councils invoice LINZ upon completion of milestones for mobilisation, data capture and data delivery for payments as agreed in the MOU. 8. LINZ supports councils with subject matter expertise related to quality assurance and other items as applicable. 9. Elevation data products are delivered to, and signed off by, the councils and LINZ. 10. LINZ provides open access to consistent-format elevation data through the LINZ Data Service, and promotes awareness and reuse of the data. |

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| <p>If your proposal is funded, what happens once the funding is spent? <i>Is your proposal sustainable once funding from the Provincial Growth Fund ends?</i></p> | <p>The PGF funding requested here is specifically to deliver data products that will be managed by LINZ for open access and reuse. The cost of data-hosting by LINZ is covered under LINZ's overall provision of national topographic information and is not dependent on funding from this proposal.</p> |
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Project Operating Budget

| Better elevation data infrastructure for growth | | | | | | |
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| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total |
| <u>Expenditure</u> | | | | | | |
| <u>Capital expenditure</u> | | | | | | |
| 3YR option TOTAL - LiDAR data procurement targeting surge regions | Commercial Information | | | | | |
| 5YR option TOTAL - LiDAR data procurement – targets all regions lacking provincial data coverage | | | | | | |
| <u>Operating expenditure</u> | | | | | | |
| Data infrastructure | | | | | | |
| Data mgmt. staff (1/2FTE) | | | | | | |
| Project lead staff (1FTE) | | | | | | |
| Procurement mgmt. staff (1FTE) | | | | | | |
| TOTAL operating | | | | | | |
| <u>Co-funding secured, source</u> | | | | | | |
| 3YR proposal capital - Anticipated council contribution to elevation data procurements | | | | | | |
| 5YR proposal capital - Anticipated council contribution to elevation data procurements | | | | | | |
| Data management infrastructure –LINZ | | | | | | |
| Programme staff – LINZ | | | | | | |
| TOTAL operating co-funding | | | | | | |
| 3yr option: Capital funding required | | | | | | |
| 3yr option: Operating funding required | | | | | | |
| 5yr option: Capital funding required | | | | | | |
| 5yr option: Operating funding required | | | | | | |
| Funding shortfall (if any) | | | | | | |