

Addendum: assessing business land demand

Additional context

Addendum prepared for the Wellington Regional
Leadership Committee Secretariat,
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Context

This note sits alongside material prepared by Sense Partners that quantifies business land demand in the Wellington-Horowhenua region. The purpose of this note is to help councils plan by clearly setting out concepts of demand for business land and to show the impact of alternative assumptions within the report.



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1. Framing demand for business land

1.1. Central government makes clear requirements on reporting business land demand

The government has set out requirements for assessing business land as part of HBAs:

1. Every HBA must estimate, for the short term, medium term, and long term, the demand from each business sector for additional business land in the region and each constituent district of the tier 1 or tier 2 urban environment.
2. The demand must be expressed in hectares or floor areas.
3. For this clause, a local authority may identify business sectors in any way it chooses but must, as a minimum, distinguish between sectors that would use land zoned for commercial, retail, or industrial uses.
4. The HBA for a tier 1 urban environment must: set out a range of projections of demand for business land by business sector, for the short term, medium term, and long term; and identify which of the projections is the most likely in each of the short term, medium term, and long term; and set out the assumptions underpinning the different projections and the reason for selecting which is the most likely; and if those assumptions involve a high level of uncertainty, the nature and potential effects of that uncertainty.

The guidance makes clear that demand is to be assessed followed by a separate capacity assessment for housing and business land that assesses supply. This matters since it is the intersection of demand and supply that creates the quantity of observed land and the price of business land we observe.

Earlier guidance, provided by the Ministry for the Environment and the Ministry of Business, Innovation and Employment, sets out a method for assessing business land demand:

- (i) Develop projections of economic activity
- (ii) Translate projections into space needs by location and zone.

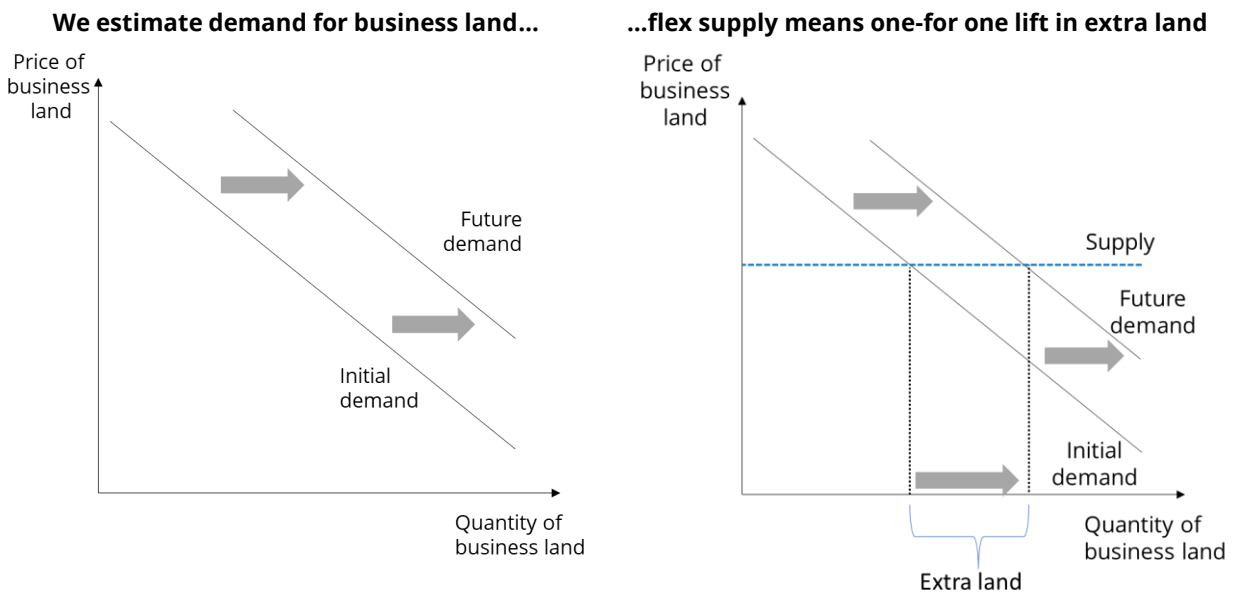
1.2. Supply helps determine observed business land

Crucially, demand is not directly observed. The quantity of industrial land depends on the intersection of demand and supply. Only in specific supply conditions will changes in demand for business land translate one-for-one with observed business land.

We set out stylised demand and supply representation in Figure 1. The left panel shows an increase in business land demand. The right panel shows that when supply is completely elastic (in other words, completely flexible), then an increase in demand for business increases the observed or realised quantity of business by the same amount with no change in the price of business land.



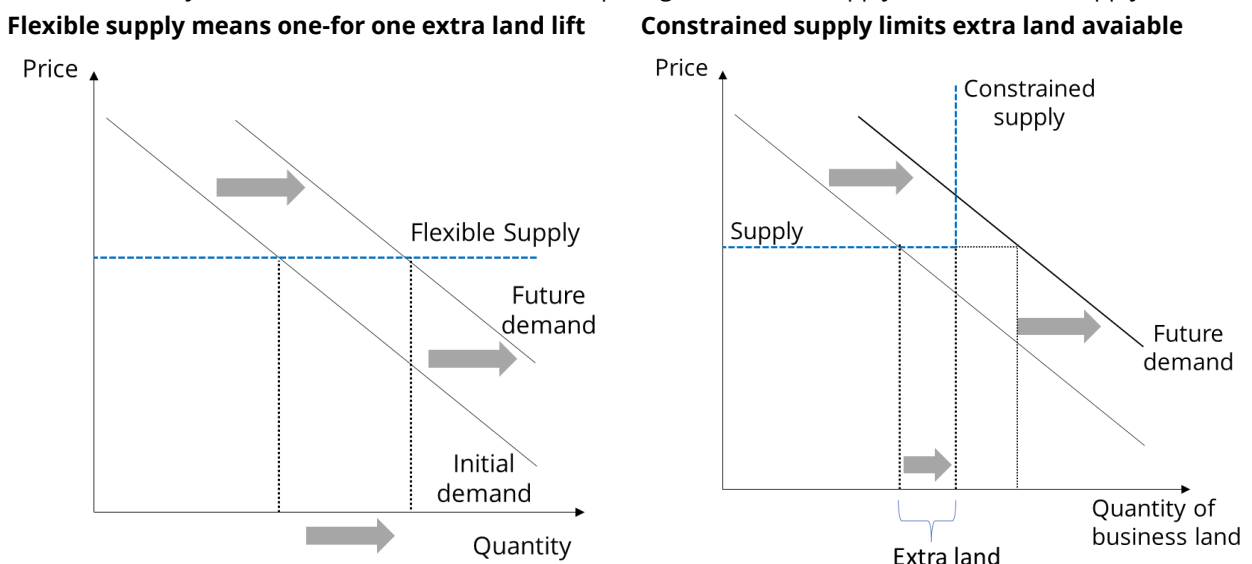
Figure 1: With elastic supply higher demand generates high quantities of business land
Stylised demand for business land with flexible business land supply



Source: Sense Partners

But the supply of business land will not always be perfectly flexible. When supply is constrained, then an increase in business land demand will not generate a one-for-one increase in observed business land. Figure 2 shows, that unlike the case of flexible supply (see left-most panel of Figure 2), only some of the additional demand results in extra observed land with some increase passed into higher prices (see right-most panel of Figure 2 below).

Figure 2: Constrained supply means higher demand shifts quantity less than one for one
Stylised demand for business land comparing flexible land supply to constrained supply



Source: Sense Partners

1.3. Supply can be constrained for several reasons

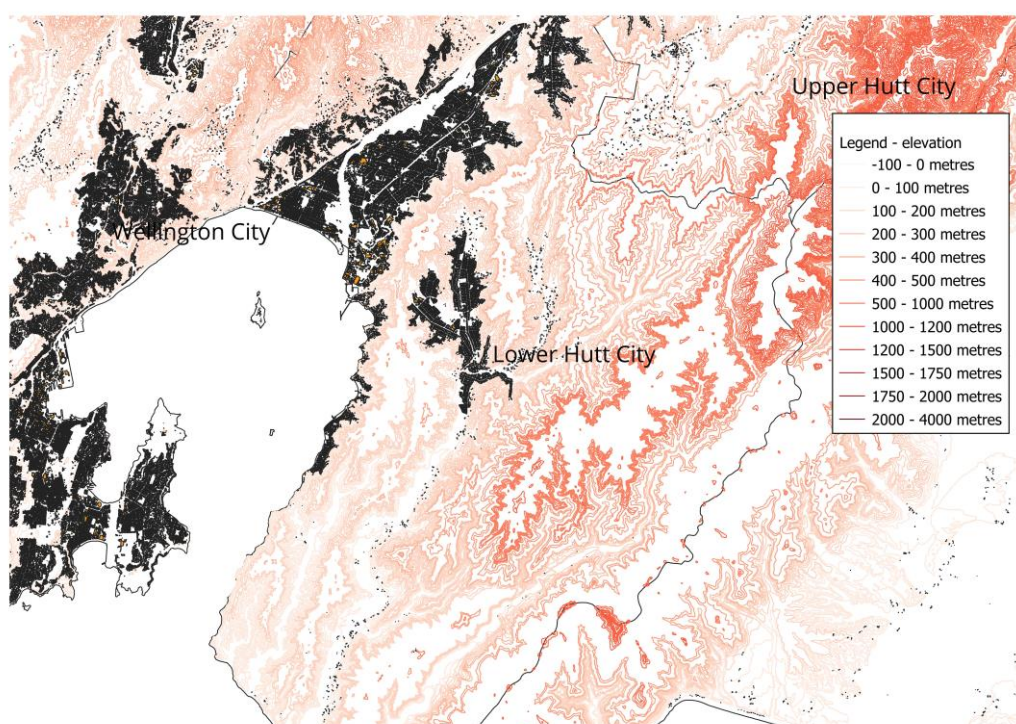
Supply can be constrained for several reasons. Zoning can constrain supply business land. But other factors also matter. Geography can play a large role in constraining supply of business land.

It is recognised that topography can also constrain supply of land to meet residential demand.

¹ The availability of flat land can also constrain growth in industrial and commercial land.²

The geography of Wellington's region and Hutt City in particular, is characterised by large areas of particularly hilly land, constraining the space available for business land.

Figure 3: Topography constrains housing supply across the Wellington region
Elevation map vs building outlines



Source: Land Information New Zealand

In addition, Wellington Harbour constrains the region's land supply. This raises the premium on making the most of available land, but we should not expect supply to be as responsive as other region's with few geographic constraints on land supply.

For many local councils in the greater Wellington region, the harbour and the coastline, in addition to topography, create strong geographic barriers to extending supply.

¹ See Saiz 2010

² See Silva et al 2014 who note unavailability of land as a major constraint on forecasting industrial and commercial land use availability.

2. Testing additional demand scenarios

2.1. Demand is uncertain and sensitive to assumptions

In addition to thinking about the impact of constrained supply on observed or realised quantities of business land, there are many assumptions that underpin assessments of business land demand.³ Usefully, our report provides estimates of the uncertainty that arises from how the economy and underlying sectors might be expected to evolve over time. These fancharts allow local councils to plan for economic activity driven by different sectors.

But the translation from the economy to demand for floorspace and in turn, business land, largely relies on assumptions, as per the Housing and Business Assessment methodology. Some of the assumptions we might expect to hold could result in lower business demand.

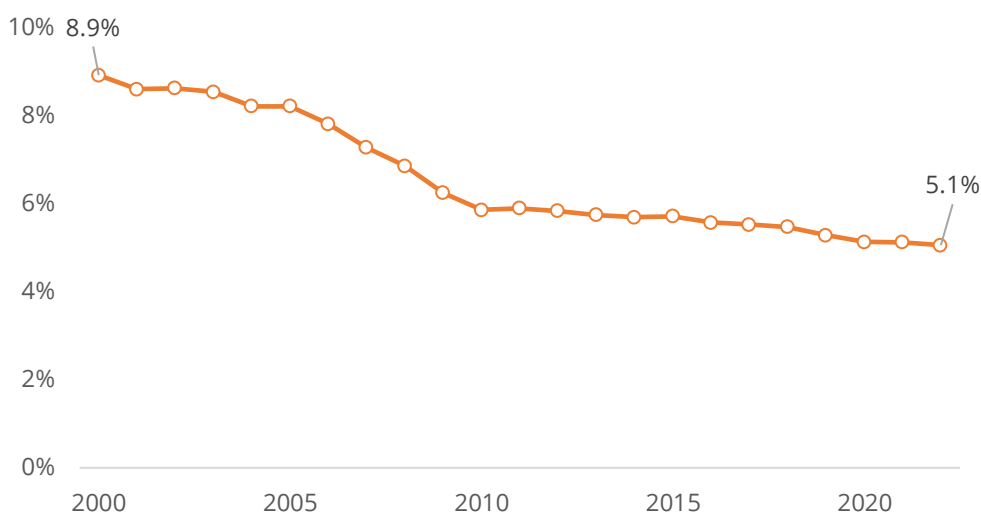
To highlight some of these possibilities, we show the potential impact on demand for business land from reasonable changes in underlying assumptions. We choose to focus on Hutt City since industrial demand is much larger – in our projections – than for many other councils.

Rather than simply change the underlying assumptions, we motivate changing some of the assumptions based on changes in the likely underlying mix of business activity in Hutt City. We begin with looking at the trend move towards lighter industrial activity.

2.2. The shift to lighter industrial activity

Our model tracks change over time in the industrial sector. Industrial activity across the Greater Wellington-Horowhenua region is declining as a share of the economy (see Figure 4).

Figure 4: Industrial activity is declining as a share of the regional economy
Industrial jobs as a fraction of total jobs, Greater Wellington-Horowhenua region

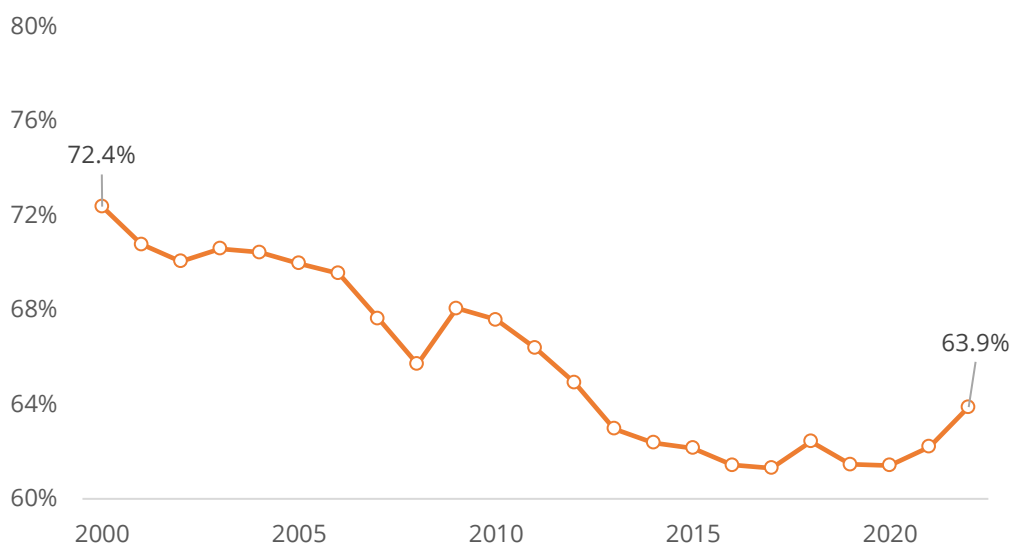


Source: Statistics New Zealand, Sense Partners

³ Hoymann 2012 notes forecasting business demand is inherently uncertain. Batista et al. 2014 shows complex models do not outperform simple linear models that relate demand to activity.

But within industrial activity, Figure 5 shows that industrial activity is tending towards lighter rather than heavy industrial activities.

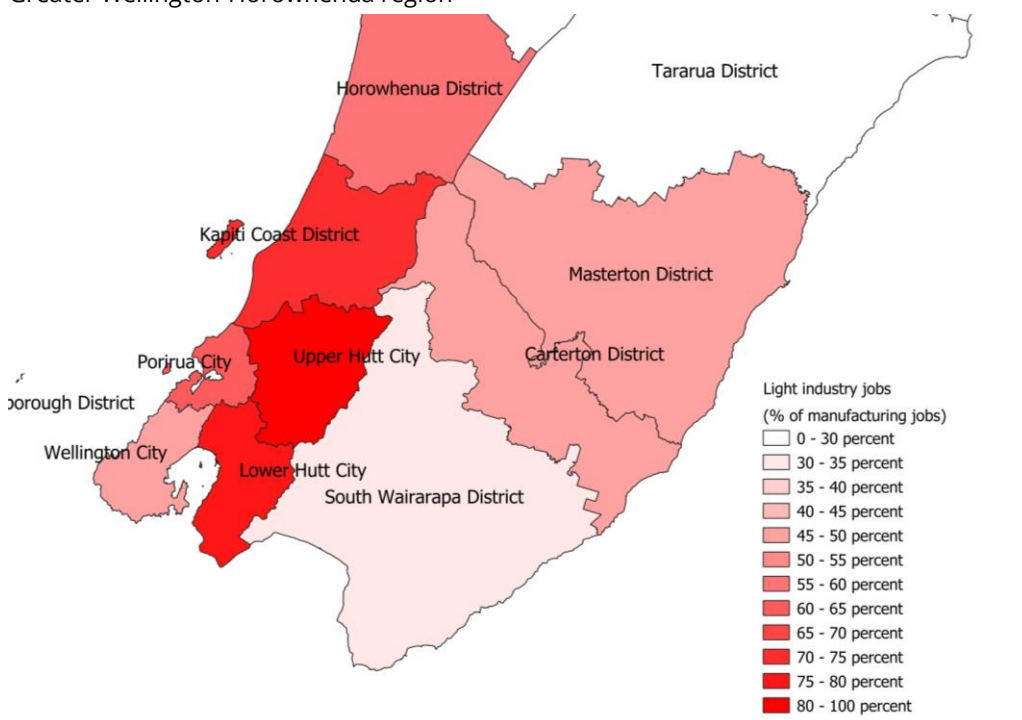
Figure 5: Industrial activity is increasingly lighter rather than heavy industrial activity Greater Wellington-Horowhenua region



Source: Statistics New Zealand, Sense Partners

There is also variation in the pattern of heavy industrial activity across the region (see Figure 6). Hutt City has particularly high shares of heavy industrial jobs at present.

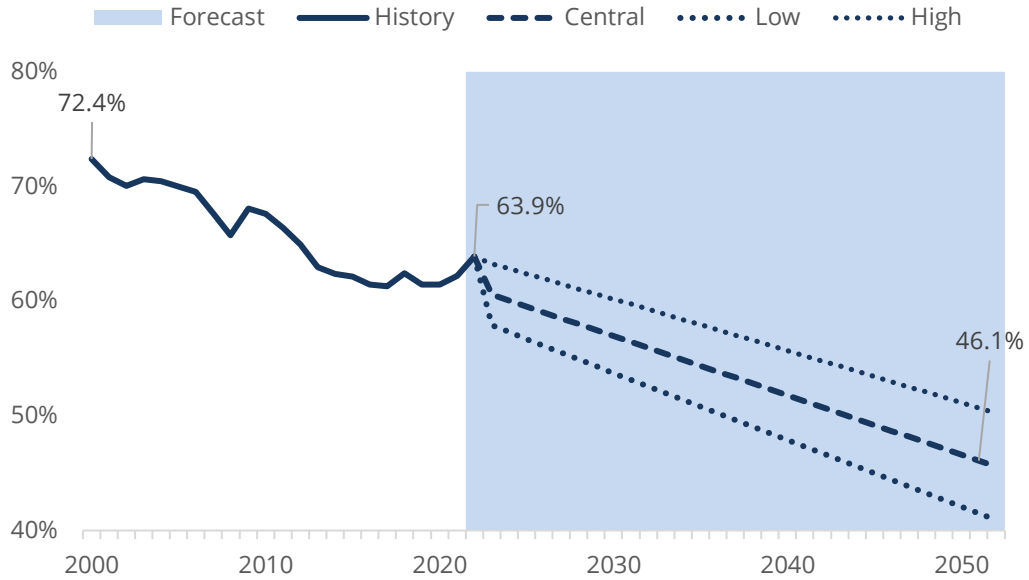
Figure 6: Some councils have higher shares of heavy industrial activity than others Greater Wellington-Horowhenua region



Source: Statistics New Zealand, Sense Partners

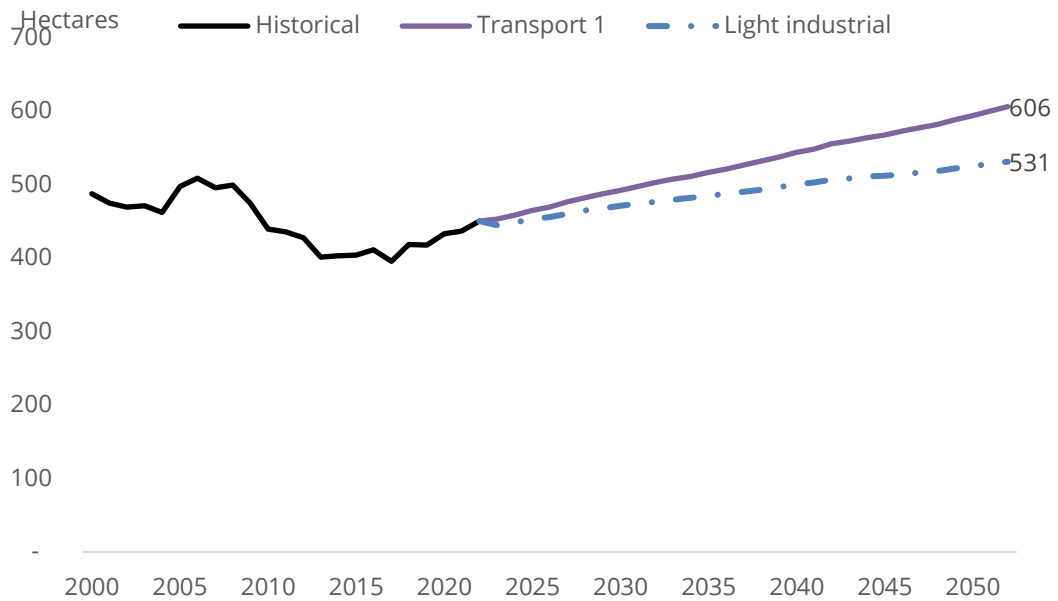
To test the likely impact on demand for business land, we forecast the intensity of industrial activity over time. We allocate jobs to either light industrial activity or heavy industrial activity (we provide the allocation weights in the Appendix). Our forecast (see Figure 7) shows we should expect a decline in the intensity of industrial activity by 2052 when heavy industrial jobs comprise less than half the total of industrial jobs. This substantially lowers the industrial land required in 2052 by about 14 percent (see Figure 8).

Figure 7: We expect the fraction of heavy industrial jobs to fall over time



Source: Statistics New Zealand, Sense Partners

Figure 8: The shift towards lighter industrial activity reduces industrial land requirements Business land demand, Base transport case vs more lighter industrial activity , Hutt City



Source: Statistics New Zealand, Sense Partners

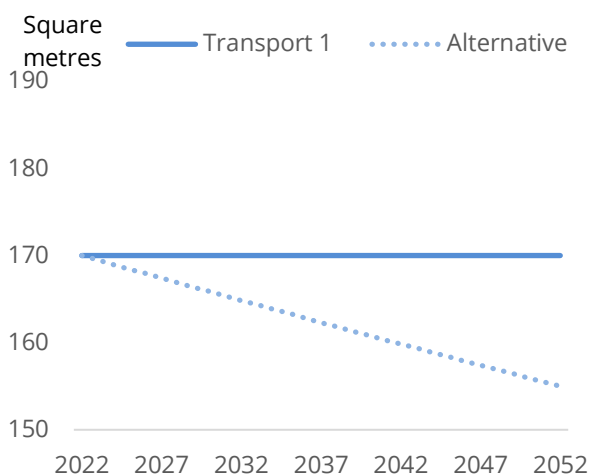
2.3. Floor to area ratios could also be compressed

In addition to the fall in heavy industrial activity, we test the impact of our underlying assumption that industrial workers each require 135 square metres of floorspace. This assumption is the midpoint of the range (100-170 square metres) suggested by earlier guidance on assessing business demand under the NPS-UDC, the precursor to the NPS-UD.⁴

We find that if heavy industrial jobs require 170 square metres of floorspace and lighter industrial floorspace takes 75 square metres, this approximates our assumption of 135 square metres across all industrial jobs.

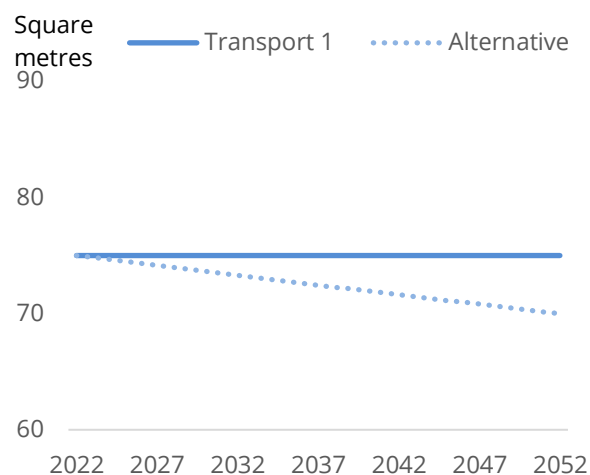
We then test the stability of our assumption of 135 metres for each industrial jobs by adopting alternative assumptions of mild declines in floorspace for light and heavy industrial sectors (approximately a ten percent decline over thirty years for heavy industries and a 7 percent declines in floorspace for light industries) that we show in Figure 9 and Figure 10.

Figure 9: Heavy industrial space could fall
Heavy industrial, base assumption vs alternative



Source: Sense Partners

Figure 10: Light industrial needs could be lower
Light industrial, base assumption vs alternative



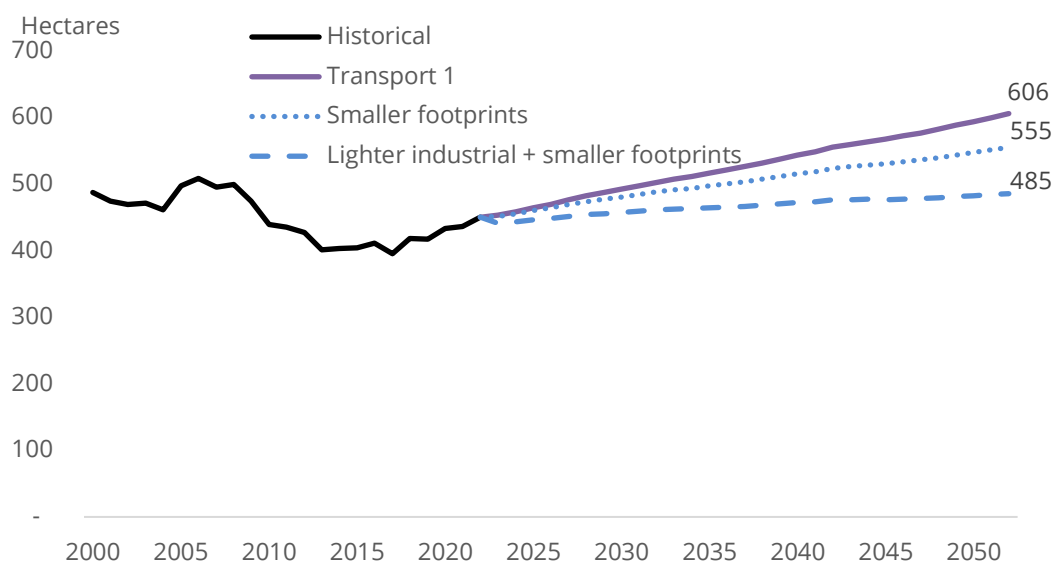
Source: Sense Partners

We find that if heavy industrial jobs require 170 square metres of floorspace and lighter industrial floorspace takes 75 square metres, this approximates our assumption of 135 square metres across all industrial jobs.

We then impose these alternative assumptions: (i) smaller footprints for both heavy and light industrial activity; and (ii) an increase in the share of lighter industrial activity; and show the impact on demand for industrial land for the case of Hutt City. Figure 11 shows that both the impact of smaller footprints (that is lower floorspace requirements per worker) and a shift towards light industrial activity both reduce the amount of business land required from 606 hectares in the base transport case to 485 in the combined scenario (dashed line).

⁴ See Ministry for the Environment and Ministry of Business, Innovation and Employment. 2016.

Figure 11: Less floorspace per worker reduced industrial land requirements
Smaller light and heavy footprints vs base assumption



Source: Sense Partners

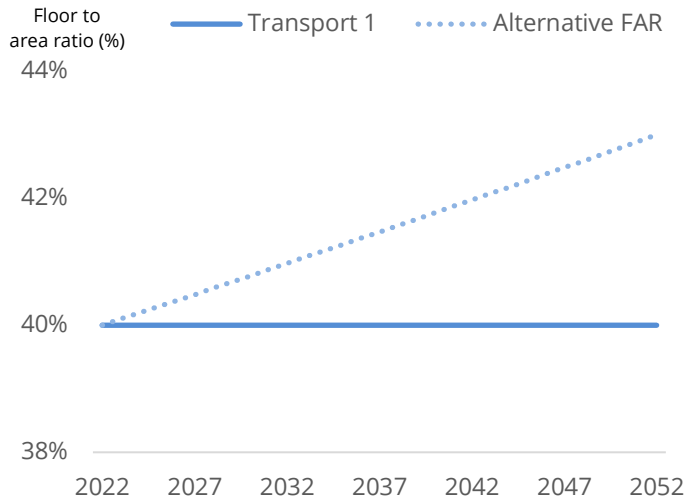
2.4. Floor to area ratios could also be compressed

To translate floor space to land demand, we make a range of assumptions based on the activity type and local council and informed by previous LiDAR analysis. For commercial activity within Wellington City Council, we use a ratio of 5 – reflecting taller buildings containing many floors in the CBD. For industrial activity in Hutt City, we use a ratio of 0.4 – each floorspace unit requires 2.5 units of land to accommodate underlying demand. We test impacts of a modest increase in the floorspace to land area ratio by imposing an alternative of 0.43 by 2052 – an increase of 7.5 % over the assumption of 0.4 (see Figure 12). Figure 13 shows that the addition of a higher FAR ratio reduces industrial land requirements close to the 2022 level. Plausible alternative assumptions about the FAR ratios, worker space requirements and the shift to light industrial land can combine to reduce demand substantially.

Figure 13 shows the results.

Figure 12: We test the impact of an alternative floorspace to land area ratio
Floorspace to Land Area Ratio (FAR), Base transport case vs alternative

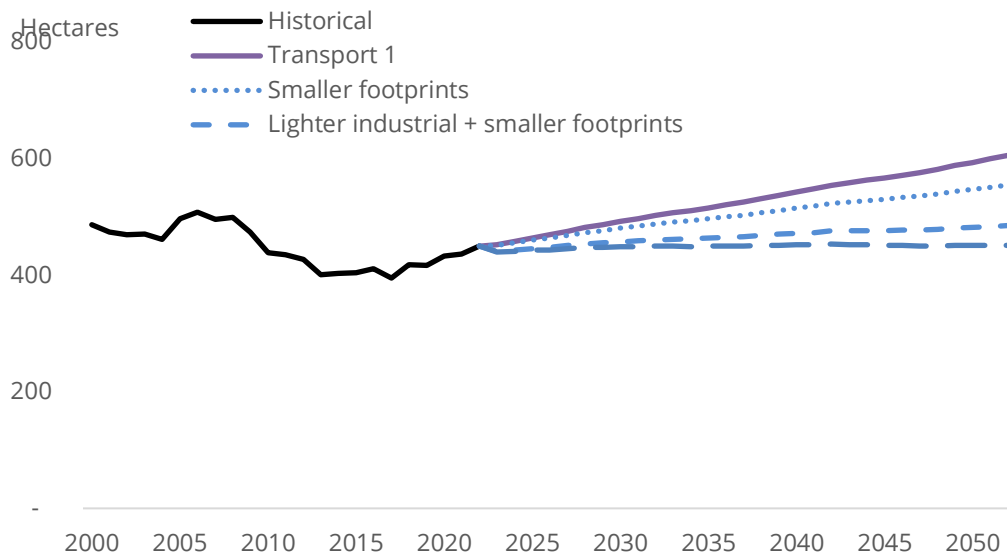




Source: Sense Partners

Figure 13 shows that the addition of a higher FAR ratio reduces industrial land requirements close to the 2022 level. Plausible alternative assumptions about the FAR ratios, worker space requirements and the shift to light industrial land can combine to reduce demand substantially.

Figure 13: Addition of a higher FAR ratio returns 2052 industrial land close to 2022 values
Impact of combining FAR assumption with light industrial and smaller footprint assumptions



Source: Sense Partners

2.5. Spatial diffusion of industrial activity

In addition to the scenarios we have explored for the case of Hutt City, when supply is constrained locally business land demand can be expected to spill over and be diffused spatially across nearby regions. For example, expect excess demand for industrial in Hutt City to be impact neighbouring councils. This spatial diffusion drives thinking about demand for

different types of business land at a regional rather than local level, supporting the approach in our report and the direction proposed under the NPS-UD.⁵

Moreover, improvements to the local infrastructure environment can influence and improve business investment in specific locations.⁶ Policy can influence the demand for specific locations by improving amenities, that can often be attracted by changes in the demographics of neighbourhoods.⁷

These factors combine to show planning for business land demand is uncertain, challenging, and conditional on a range of assumptions. Understanding constraints on supply and seeking a collective approach to accommodating regional demand is likely to return better outcomes.

⁵ See Ministry for the Environment 2020, National Policy Statement on Urban Development

⁶ See Ploegmakers et al. 2018.

⁷ See Wang and Wen, 2021.



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Appendix: Industry index weights

Figure 14: Industry weights used to define light and heavy industrial categories

| ID | Description | Light industry weight | Heavy industry weight |
|------|---|-----------------------|-----------------------|
| C11 | Food Product Manufacturing | 0.20 | 0.80 |
| C12 | Beverage & Tobacco Product Manufacturing | 0.20 | 0.80 |
| C13 | Textile, Leather, Clothing & Footwear Manufacturing | 1.00 | 0.00 |
| C14 | Wood Product Manufacturing | 0.20 | 0.80 |
| C15 | Pulp, Paper & Paper Product Manufacturing | 0.20 | 0.80 |
| C16 | Printing | 1.00 | 0.00 |
| C17 | Petroleum and Coal Product Manufacturing | 0.20 | 0.80 |
| C18 | Basic Chemical & Chemical Product Manufacturing | 0.20 | 0.80 |
| C19 | Polymer Product & Rubber Product Manufacturing | 0.20 | 0.80 |
| C20 | Non-Metallic Mineral Product Manufacturing | 0.20 | 0.80 |
| C21 | Primary Metal and Metal Product Manufacturing | 0.20 | 0.80 |
| C22 | Fabricated Metal Product Manufacturing | 0.20 | 0.80 |
| C23 | Transport Equipment Manufacturing | 0.20 | 0.80 |
| C24 | Machinery and Equipment Manufacturing | 0.20 | 0.80 |
| C25 | Furniture and Other Manufacturing | 0.20 | 0.80 |
| D26 | Electricity Supply | 0.20 | 0.80 |
| D27 | Gas Supply | 1.00 | 0.00 |
| D28 | Water Supply, Sewerage & Drainage Services | 1.00 | 0.00 |
| D29 | Waste Collection, Treatment & Disposal Services | 0.50 | 0.50 |
| E | Construction | 0.50 | 0.50 |
| F | Wholesale Trade | 1.00 | 0.00 |
| H | Accommodation and Food Services | 0.88 | 0.12 |
| I46 | Road Transport | 0.70 | 0.30 |
| J58 | Telecommunications Services | 0.85 | 0.15 |
| O753 | Local Government Administration | 0.85 | 0.15 |

Source: Sense Partners



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