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It does not represent the views of the Ministry of Transport.

Upper North Island Supply Chain Strategy

Land Value

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30 June 2020

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Glossary of Abbreviations

Abbreviation	Stands for
AC	Auckland Council
AT	Auckland Transport
AUP	Auckland Unitary Plan
BOPRC	Bay of Plenty Regional Council
CBA	Cost Benefit Analysis
GDP	Gross Domestic Product
MACA	Marine and Coastal Area (Takutai Moana) Act
MBIE	Ministry of Business, Innovation and Employment
MMH	Marsden Maritime Holdings Limited
MoT	Ministry of Transport (New Zealand)
NRC	Northland Regional Council
NZTA	New Zealand Transport Agency
POAL	Ports of Auckland Limited
PoT	Port of Tauranga Limited
RMA	Resource Management Act 1991
TEU	Twenty-foot Equivalent Unit
UNISCS	Upper North Island Supply Chain Strategy
WTA	Willingness-to-accept
WTP	Willingness-to-pay

Executive summary

This report documents the work undertaken within the land value workstream. It uses a total economic value framework to identify the plausible economic benefits from alternative uses of Auckland waterfront land under a scenario where the Ports of Auckland freight operations are relocated elsewhere. The benefits identified are grouped into use benefits and non-use amenity benefits. The results of the estimation of these benefits are included in the cost benefit analysis (CBA), which is outlined in the integrative report for this study.

The benefits from the alternative use of the waterfront land, under mixed-use assumptions, include productivity gains from agglomeration, economic surpluses from the creation of new dwellings (apartments), visual amenity value to local residents and the amenity value of a new public park for domestic visitors to Auckland. These use benefits are estimated to be between $4 million and $60 million, in present value terms, over the period to 2079. A value of $32 million, in present value terms, is used for the CBA.

The most substantive benefit estimated here is for the social licence / indirect amenity value. The present value of the potential amenity benefits that could accrue to Auckland households over the period to 2079 is estimated to lie in the range of $820 million to $1,007 million. While this is an approximation only, the values estimated give a broad sense of the potential amenity benefits relevant to the relocation of port freight operations from the current site. For the purposes of the CBA, a mid-point value of $914 million, in present value terms, has been included.

The 2019 consultants' report to the Upper North Island Supply Chain Strategy Working Group concluded that the estimated increases in property rates and land lease revenue from the alternative uses of the waterfront land would mean that Auckland Council would be financially advantaged. While the potential changes in revenue from property rates and land leases would represent financial impacts for Auckland Council, they are not economic impacts from a societal perspective and so should not be included in a cost benefit analysis. Property rates levied by a council are essentially a form of tax. i.e. a transfer payment that redistributes resources within society without changing the level of well-being in aggregate. Land lease revenue received by Auckland Council for alternative uses of the waterfront land would be part of the price that purchasers (i.e. developers, future residents) pay for using the land asset and so should be treated as a transfer, not a gain, in social wealth.

Furthermore, a material net financial benefit to Auckland Council appears to be unlikely. Property rates are set to recover the Council's budgeted costs from across the rating base. The experience with land lease revenue for alternative uses of former industrial land is that the revenue is generally sufficient to cover the substantial expenditure associated with land remediation and infrastructure requirements.

1. Purpose and approach

This section outlines the purpose of this report and the approach taken to the work.

1.1 Purpose of this report

This report accompanies the integrative report that summarises the findings of a collective of consultants led by Sapere Research Group (Sapere) in relation to the Upper North Island Supply Chain and the options for a full move of the freight operations of the Ports of Auckland Ltd (POAL).

This report documents the work undertaken within the land value workstream, with respect to determining the economic benefits that could arise from the alternative use of the waterfront land in the event that the POAL freight task is handled elsewhere. These impacts have been prepared as an input into a cost benefit analysis of the options.

This report and its economic approach is separate from the commercial valuation of the waterfront land, prepared as part of this wider work programme.[1]

1.2 Approach to this work

The starting point has been to assess the work undertaken for the 2019 consultants' report to the UNISCS Working Group.[2]

The core of this work has been to confirm an economic framework to guide thinking about the potential effects. This was followed by the preparation of a series of estimates of the impacts, to the extent possible with the data available and by drawing on relevant literature.

Engagement was also undertaken with parts of the Auckland Council Group to understand some practical perspectives. This included meetings with representatives of the Chief Economist's Unit, the Financial Policy Team and Panuku, the Council-controlled organisation for urban regeneration.

[1] "Indicative realisable value of Auckland port land" prepared by Marnus Beylefeld, 15 March 2020
[2] EY (2019) *Economic Analysis of Upper North Island Supply Chain Scenarios*, 9 August 2019

2. Assessment of prior approach

This section assesses how the study undertaken for the UNISCS Working Group in 2019 dealt with potential economic benefits arising from the alternative use of the waterfront land.[3]

2.1 Approach of prior study

If the POAL site is vacated, it is highly likely that the site will be redeveloped. The 2019 study included a hypothetical masterplan, prepared by architects, Warren and Mahoney, to inform an analysis of the potential benefits from a change in use of the waterfront land. That work suggested that the site could be used for a mixed-use development, including residential, hotel, commercial and retail uses, as well as significant area set aside for public space. The following assumptions were made under the scenario where the port's freight operation is relocated elsewhere.

- Land area – 78 hectares of waterfront land would become available for alternative uses.
- Land tenure – Auckland Council maintains the land in public ownership, operating 120-year leases in a similar approach to what has occurred with the Wynyard Quarter.
- Land use – a mix of public spaces / parks (34%), streets and laneways (24%) and land plots for development (43%).
- Intensity of use – allowing for gross floor area 1.3 million m2.

The focus was on assessing the potential for increases in Auckland Council income, through property rates and land lease revenue, as a result of more intensive commercial and residential activity on the waterfront land. This is done by using benchmarks to calculate the annual rate of return expected for the commercial and residential gross floor area. The results are offset by an estimate of the POAL dividend forgone. The results can be summarised as follows.

Table 1 Benefits from alternative use of waterfront land, 2019 study

Component	Annual basis ($m)	Net present value ($m)
Council rates income	42	313
Council leasehold income	56	412
POAL divided forgone	-40	-147
Net impact	58	577

Source: EY (2019) Figures taken from CBA model (30-year timeframe)

[3] EY (2019) *Economic Analysis of Upper North Island Supply Chain Scenarios*, 9 August 2019

2.2 Cost benefit analysis focuses on economic impacts from a societal perspective

Property rates levied by a council are essentially a form of tax. i.e. a transfer payment that redistributes resources within society without changing the level of well-being in aggregate. Therefore, any additional rates revenue raised by the alternative development of the waterfront land would not be an appropriate measure of economic welfare. In a cost benefit analysis framework, taxes are treated as transfer payments that, on net, do not increase a society's well-being.

> They redistribute resources without affecting the overall well-being of society (assuming, for example, that the marginal utility of income is constant). The person providing the payment does not directly receive any goods or services in return for the payment. (Dobes, Leung, & Argyrous, 2016, p. 83)

Land lease revenue received by Auckland Council for alternative uses of the waterfront land would be part of the price that purchasers (i.e. developers, future residents) pay for using the land asset and so should be treated as a transfer, not a gain, in social wealth.

> Benefits to businesses, such as increased revenue, are economic transfers rather than national economic benefits and are therefore not included. (NZTA, 2018 pp. 4-10)

In conclusion, changes in revenue from property rates and land leases would represent financial impacts for Auckland Council but they are not economic impacts from a societal perspective and so should not be included in a cost benefit analysis.

2.3 A material net financial benefit to Auckland Council appears unlikely

The 2019 study concluded that the estimated increases in property rates and land lease revenue from the alternative uses of the waterfront land would mean that Auckland Council would be financially advantaged.

> Auckland Council and ratepayers would be financially better off if the Port site was redeveloped. Presently, POAL delivers a dividend to the Auckland Council of around $50 million per annum. An alternative land use for the port site has the potential to generate rates and leasehold income in excess of the current POAL dividend. (p. 7)

A material net financial benefit to Auckland Council appears to be unlikely under plausible assumptions. Property rates are set to recover the Council's budgeted costs from across the rating base. The experience with land lease revenue for alternative uses of former industrial land is that the revenue is generally sufficient to cover the substantial capital expenditure associated with land remediation and basic infrastructure requirements. Interviews with representatives from the Auckland Council Group suggest that the Council would be unlikely to receive a material net financial benefit.

3. An economic framework for alternative uses

This section introduces a framework to help determine the potential impacts from an economic perspective. It also outlines the assumptions for alternative uses of the waterfront land.

3.1 Total economic value framework

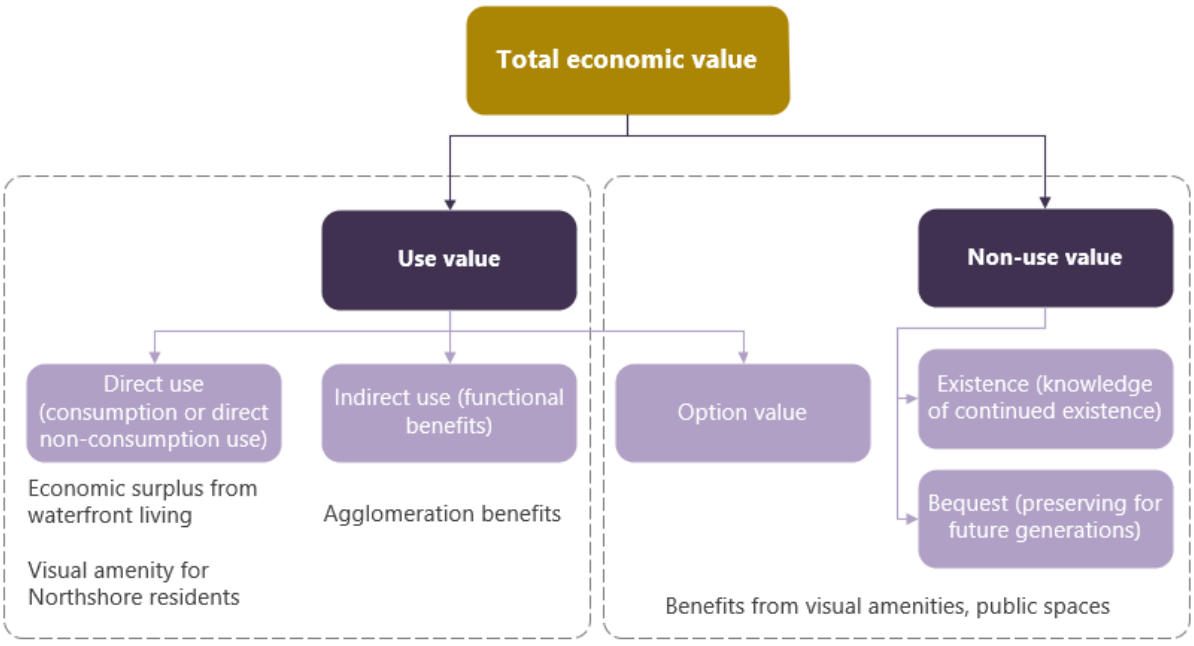
We use the total economic value (TEV) framework to estimate benefits of alternative land use (see Figure 1). This framework is used in cost benefit analyses to identify the values that people derive from natural resources or infrastructure systems (amongst other things). In our context, it provides a convenient way to categorise the different values that could be associated with the alternative development of the land resource. We then use different methods to estimate each use or non-use value, as described later in this report.

Traditionally, assessments of transport network investments consider two broad types of benefit:

- Direct user benefits arising from travel time and cost savings.
- Wider economic benefits, which "arise when economic agents cannot capture the entire benefits (or costs) of their actions, i.e. they create externalities that are of value for other agents" (Venables, 2016). An example would be improved productivity due to higher density (i.e. an agglomeration effect). Other examples are discussed later in this report.

The TEV framework allows us to expand on the nomenclature of benefits to include non-market direct values that arise from visual amenity and non-use values that can arise from an open public space, such as a new public park.

Figure 1 Total economic value framework



3.2 Assumptions for alternative uses of waterfront land

We retain the key assumptions of the 2019 report with respect to land area and mix of land use.

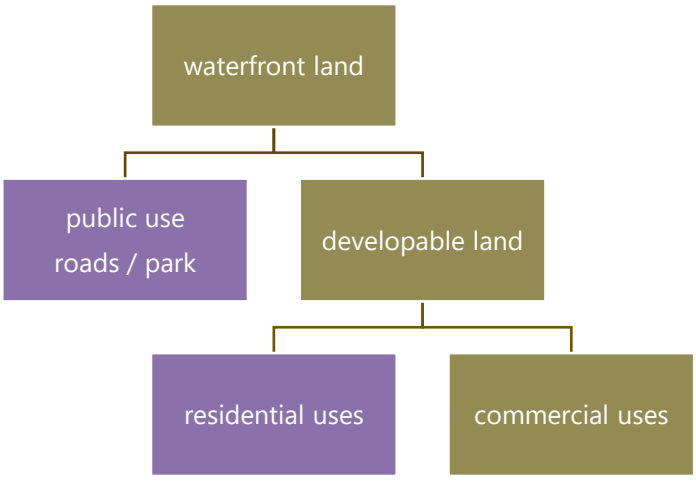
1. Land area – 65ha land + 12ha wharves.
2. Mix of land use – streets (24%), parks (32%), residential and commercial uses (43%) (2019).

To which we add:

3. Timeframes – our assumption is that the waterfront would become available in approximately 2040 and that long-term leaseholds would be released to the market over a period of 30 years. That timeframe suggests the land release will be well-signalled to the market.
4. Intensity of development converted into dwellings/workers, while acknowledging this a function of future height allowances that may be more permissive.
   - 5,500 dwellings (residential development)
   - 10,000 workers (commercial development).
5. Intensity of use, namely, the number of visitors to the public amenity of a substantive new park on the waterfront. As a proxy for use by non-Auckland residents, we draw on Stats NZ Accommodation Survey data to determine the number of domestic visitors to Auckland (i.e. approximately 548,000) per annum.

We work with the following framework for estimating economic benefits from residential development and building of public amenities.

Figure 2 Framework of alternative uses of waterfront land



3.3 Consideration of additionality versus substitution effects

Estimates of total economic value of alternative land use must consider whether the development would be an addition to, or substitute for, development that would otherwise occur. The two effects are defined as follows.

Substitution occurs when new developments displace developments that would otherwise occur in a different location, under the counterfactual where the waterfront land does not become available.

Additionality occurs when the new developments (residential, commercial, public space) are in addition to developments that would otherwise occur under the counterfactual. Additionality could plausibly occur for two reasons:

- There is latent demand for such space that is only revealed when supply reaches the market.
- Waterfront development gives a signal to property developers that the supply market has picked up. Increased supply creates expectations that prices will drop, incentivising property developers to increase their output to minimise impacts on future cash flows. This effect is on the basis that "the implementation of a local project influences the investment decisions of other actors in other locations" (de Groot, Marlet, Teulings, & Vermeulen, 2015, p. 112).

In reality, it is difficult to determine the extent to which alternative waterfront land development reflects substitution or additionality effects. It is possible that the housing supply market may reach an equilibrium in the next 30 years (i.e. become more responsive to demand), which would weaken the case for assuming additionality. Alternatively, it is also possible that the supply of housing continues to lag demand, as has been the case for some time.

Given this future uncertainty, our approach is to assume a mid-point of 50% additionality, but to also show the results for 100% additionality to provide a sense of the upper bound of benefits.

3.4 Description of benefits from alternative land use

We started by considering a long list of potential benefits from alternative use of the waterfront land, grouped into direct use values, indirect use values, option use values and non-use values. We have then excluded those benefits that are not compatible with a CBA framework (e.g. increased tax payment due to higher effective wages resulting from new labour supply), and those which we lacked sufficient information to estimate the impacts (e.g. retail effects). Appendix B: provides more detail on the benefits excluded, and the reasoning behind the exclusions.

The benefits included are described in the tables below. Appendix A: provides the long list of benefits initially considered.

Table 2 Benefits estimated

Nature of benefit	Type of user	Benefit description
Gains in consumer welfare	Resident	Consumer surplus arising from new supply of waterfront apartments, with a corresponding impact on the price of that category of dwelling. The gains in welfare capture values placed on visual amenities and any trade-offs with commuting costs.
Gains in producer surplus	Property developers	New profits to property developers.
Visual amenity for non-residents (e.g. North Shore residents)	Wider public	Non-residents derive amenity benefits from the new harbour skyline.
Agglomeration	Worker	Improved accessibility or relocation of firms/workers (from outside city) makes places denser, resulting in increased productivity.
Amenity from public spaces	Wider public	Visitors derive amenity benefits from having the option to visit the public space.

4. Estimation of use benefits

This section outlines the methods used to estimate the use values and the results obtained.

4.1 Overview of methods

This section outlines the approach to estimate each of the benefits identified in the long list (6.Appendix A:), differentiated by the assumption of substitution versus additionality.

Table 3 Methods to estimate benefits

Benefit is estimated to the extent data is available

Benefit is not estimated due to lack of data

Benefit is not estimated as it is likely to be zero on net

Benefit description	Substitution effect	Additionality effect
Gains in consumer welfare	Captured by the difference in the gains of consumer surpluses from alternative and BAU housing location. These are not directly estimated but would be much smaller than under additionality.	Captured by the gains in consumer surplus from alternative land use.
Gains in producer welfare	Captured by the difference in the gains of consumer surpluses from alternative and BAU housing location. These are not directly estimated but would be much smaller than under additionality.	Gains in producer surplus from new property development.
Worker productivity gains due to agglomeration effects	Zero effect on net.	Estimated based on elasticity of productivity with respect to city size as per (Nunns & Denne, The costs and benefits of urban development: A theoretical and empirical synthesis, 2016).
Visual amenity benefits to North Shore residents	An improved view premium proxy taken as the difference between water view and incremental view premium as per (Bourassa, Hoesli, & Sun, 2003).	An improved view premium proxy taken as the difference between water view and incremental view premium as per (Bourassa, Hoesli, & Sun, 2003).
Option value from the new public space	Zero net impact if substitute public space is zero. If substitute public space is not park (e.g. Viaduct), net impact not estimated due to missing WTP estimates for the specific substitute.	Total WTP to visit the alternative park for recreation (less any cost).

4.2 Detailed description of methods

This section provides a detailed description of the estimation for the following benefits: economic surpluses from residential apartments, productivity gains from agglomeration benefits, amenity value to North Shore residents, amenity value of a public park.

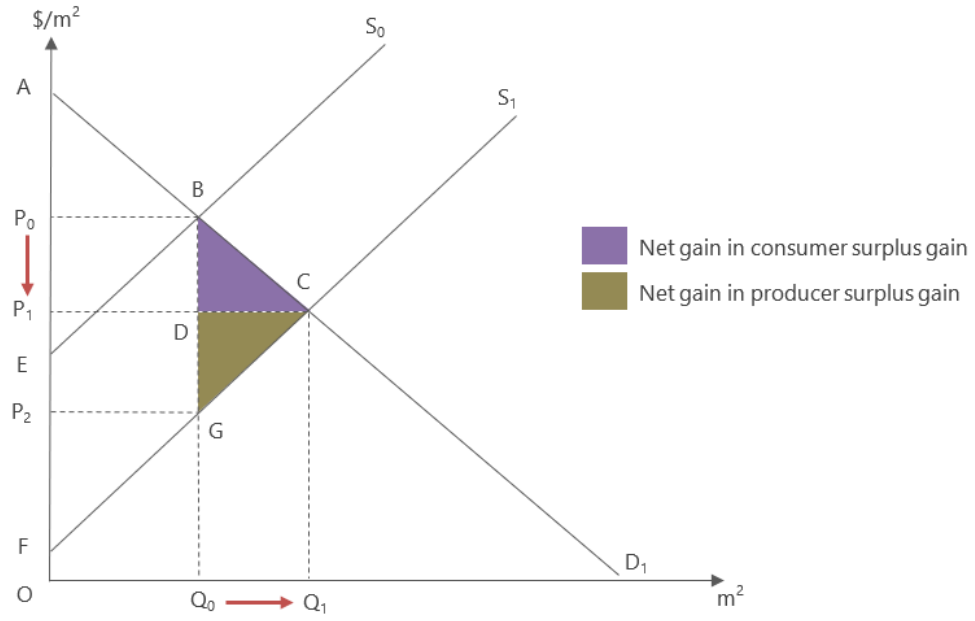
4.2.1 Economic surpluses from residential apartments

Total economic surplus comprises consumer and producer surplus. Consumer surplus is a measure of consumer benefits arising from the fact that consumers pay less than what they are willing to pay, with the consumers' willingness-to-pay being captured by the demand curve.

Producer surplus is a measure of producer welfare, and is the difference between what a producer is willing to accept for a good or service provided, and the actual price they receive. In effect, producer surplus measures economic rents to the producer.

We measure total economic surpluses assuming the effect is additional (50% or 100%) – this allows us to determine the upper bound of surpluses. Conceptually, this is illustrated in Figure 3. When additional supply enters the market to meet latent demand, the supply curve shifts from S_0 to S_1. We are interested in estimating *gains* in consumer and producer surpluses as a result of this shift.

Figure 3 Economic surplus from additional supply of waterfront apartments



Source: Sapere

Consumer surplus. In the figure above, the supply shift causes total consumer surplus to increase from ABP_0 to ACP_1, resulting in a gain equal to P_0BCP_1. However, not all of this gain can be attributed to the new waterfront dwellings. The P_0P_1DB area reflects a transfer of wealth between consumers, as benefits accruing to new buyers as a result of cheaper housing are offset by the fact that existing owners cannot sell or rent their houses for as much. Therefore, the net gain in consumer surplus is area DBC.

Producer surplus. The supply shift causes total producer surplus to increase from P_0BE to P_1CF, resulting in a gain equal to P_1CGP_2 (triangles $P_0BE$and P_2GF are equal assuming a parallel shift in supply). However, any gain in producer surplus to the right of Q_0 cannot be considered, because developers had already sold their properties and no developer can provide those properties at a lower cost (note that this point holds even if the supply shift is not parallel). In other words, the producer gain measured by P_1DGP_2 is not achieved. Therefore, the net gain in producer surplus is area CDG. Total economic surplus is therefore the sum of the areas of triangles BDC and CDG.

We use the following assumptions to determine total economic surplus from waterfront residences.

Table 4 Assumptions used to estimate total economic surplus from new waterfront apartments

Name	Value	Source
Start of apartment release (year)	2040	Internal assumptions used in this study.
End of apartment release (year)	2069	
Total number of new apartments	5,500	
Number of apartments released per year	183	
Number of new apartments in Auckland City (2019)	25,793	Based on Stats NZ data on building consents and Warren & Mahoney (EY 2019 CBA model) assumption of 70 m2 as average apt size.
Auckland City average apartment price (2019)	$735,750	Auckland apt average price for 2019 ($545,000[4]) adjusted up by 35% (this figure reflects waterfront premium for CBD dwellings based on Auckland Council estimates from RUB report, (Martin & Norman, 2020).[5]
Annual Auckland City apartment price growth through to 2030	6.7%	REINZ 5-year average for Auckland City (REINZ, 2019).
Annual increase in demand for apartments	2.1%	Reflects Stats NZ average household growth projections.[6]
Price elasticity of supply	0.7 in 2030, increasing to 0.9 in 2040, and 1 in 2069	0.7 price elasticity of supply is based on (Sanchez & Johansson, The price responsiveness of housing supply in OECD countries, 2011) – we assume that the responsiveness in the housing supply market does not materially change till 2030. Subsequently, the market becomes more responsive such that elasticity improves through to 2069. The 0.9 and 1 values are based on (Nunns & Denne, The costs and benefits of urban development: A theoretical and empirical synthesis,

[4] https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12264675

[5] We recognise that not all Auckland City apartments will have this premium, and, therefore, this estimated average price is likely to be on the upper bound. Our sensitivity analysis, however, shows that the premium doesn't significantly affect the final results. Although removing the premium altogether reduces the total surplus by 9.2%, it reduced total net benefits from alternative land development by only 0.1%.

[6]http://archive.stats.govt.nz/browse_for_stats/people_and_communities/Families/SubnationalFamilyandHouseholdProjections_HOTP13-38.aspx

Name	Value	Source
		2016) assumptions for a market with reduced regulatory barriers.

4.2.2 Productivity gains from agglomeration benefits

Agglomeration benefits arise from firms or workers clustering for some activities that are more efficient when spatially concentrated (NZTA, 2018). The willingness of firms in dense urban areas to pay higher nominal wages and higher land rents requires that there are productivity advantages from locating there.

> This is over and above the direct productivity effects of faster journeys, and arises because of the intense economic interaction that occurs in economically large and dense places. This is why cities and other agglomerations exist. This observation is backed-up by a substantial research literature that quantifies the positive relationship between economic density and productivity. (Venables, 2016, p. 6)

In the 100% additionality scenario, we assume that the additional 10,000 workers increase the city size over the 2040-2069 period, thereby increasing the effective density of employment in the city. In the 50% additionality scenario, the agglomeration benefit reflects 5,000 new workers.

We assume a gradual release of office space over the 2040-2069 period, such that 333 or 167 new workspaces are created every year in the 100% and 50% additionality scenarios respectively. There are no agglomeration benefits in the substation scenario (viewed at the Auckland region scale), as the city size does not change.

Based on (NZTA, 2018) and (Nunns & Denne, The costs and benefits of urban development: A theoretical and empirical synthesis, 2016), we use the following equation to estimate productivity gains:

$$\Delta Productivity = \frac{New\ city\ size}{Current\ city\ size}^{Productivity\ elasticity} - 1$$

where productivity elasticity is with respect to city size, and assumed conservatively to be 0.03 based on (Nunns & Denne, The costs and benefits of urban development: A theoretical and empirical synthesis, 2016).[7] This figure is also consistent with lower bounds in recent work as summarised by Venables (2016, p.9).

The change in productivity is then applied to Auckland GDP to determine increase in productivity for existing residents. In the additionality scenarios, the productivity gains are permanent, i.e. the maximum productivity gain achieved in 2069 extends in the future.

[7] The authors assume a range of 0.02 to 0.04. We take the average.

We observe that our estimate of agglomeration benefits is an upper bound because the scale of agglomeration in our context may be too small for the productivity gains to apply

> It is only the large and complex urban transport activities that will provide the relevant conditions that justify an analysis of agglomeration benefits. ((NZTA, 2018, pp. 5-406)

4.2.3 Amenity value to North Shore residents

4.2.3.1 Estimating the water view improvement premium

Premia based on an older study

There may be an increase in consumer surplus to current residents from a distant harbour view that is not disrupted by port infrastructure. Bourassa, et al. (2003) estimates a water view premium of $30,047 in 1996 prices. Assuming that the share of water view premium relative to sale prices is fixed (9.7%), and that the North Shore median housing price was $985,000 in 2019,[8] this translates to $95,263 in 2019. Not all of this value can be attributed to the dismantling of port's industrial footprint – some of the water view premium is already captured in the current market price. To determine the proportion that could be attributed to an improvement of the water view, we use another premium estimated by Bourassa, et al. (2003) for attractive immediate surroundings, referring to "good appearance of nearby improvements" (Bourassa, Hoesli, & Sun, 2003, p. 9). This premium is estimated to be $31,822 in 1996 prices. Assuming a fixed proportion of this premia (11.2%) relative to the sale price, this translates to $102,059 in 2019.

We could therefore infer a premium for water view improvement due to alternative land use by taking the difference between the estimates for water view premium and the attractive immediate surroundings premium, i.e. $13,754 in 2019 prices. Over the long-term, the premium is estimated on the assumption that North Shore housing prices increase at a rate of 5.6%, based on 5-year average for Auckland City as per (REINZ, 2019).

Premia based on a more recent study

A recent study by the Auckland Council on the price premia on land inside or outside Rural Urban Boundaries[9] has determined that the water view premium on an average property is $270,000. This is 2.8 times higher than the premium estimated by Bourassa, et al. (2003), and would more accurately capture preferences in the current market. It can be argued that an increase of this scale would also apply to premia for attractive immediate surroundings – after all, the supply of such property is not unlimited, and the increase in population and welfare since the survey by Bourassa, et al. (2003) would have placed increased competition for such property. In the absence of a more recent estimate of the premium for "good appearance of nearby improvements," we make the simplistic assumption that the proxy for water view improvement must be adjusted up by a factor of 2.8, i.e. $42,055 in 2019 prices.

[8] Based on (REINZ, 2019)
[9] See (Martin & Norman, 2020)

We note that there are limitations with the approach above for estimating the visual amenity benefits from dismantling the port, as the proxy selected does not directly measure improvements in water views. Nevertheless, it can be argued that it does capture some value placed on "good appearance" of surroundings; based on the estimates above, the view improvement value is 16% of the waterfront premium or 4% of the house price, which is not unreasonable.

4.2.3.2 Estimating the number of affected households

We estimate that there are approximately 261 properties with a view of the port. These properties are located in Devonport, Stanley Point, North Head and Northcote Point. The Stanley Point landmass would block the view of the port for Bayswater, Hauraki and Narrow Neck residents, so these areas were not included in the estimation. This estimate is an upper bound because, in many cases, visual obstacles such as trees or the Northern Motorway are likely to be blocking the view of the port, but for simplicity, these properties were included anyway.

The assumption is that only properties on a coast with visibility of the port would be affected. An R script was written using Google Maps API to query points near to a property to determine if they are in land or water. Properties with water near their homes must be on a coast, then some further analysis determines if these properties are on a coast which faces the POAL site. If they are on a coast with visibility of the POAL site, then they are included in the 261 houses which are affected.

4.2.3.3 Estimating the water view improvement premium over time

Given that residential and office construction takes place throughout the assumed time horizon – which itself affects the view – we assume that the water view improvement premium benefit accrues gradually 10 years after the development commences. This means that the affected households gain only 1/20th of the full benefit (at current market prices) each year.

4.2.4 Amenity value of a public park

We assume that the park is developed between 2045 and 2049, so that it is open to the public starting with 2050. The benefits are estimated through to 2079.

4.2.4.1 Willingness to pay for general recreation

Ball, et al. (1997) estimate that a visitor's willingness to pay (WTP) for recreation in Auckland regional parks is $11 in 1996 prices. They use the Unit Day Value method, which uses results from previous contingent valuation studies or travel cost studies. The estimated WTP value must be adjusted to 2019 values to reflect changes in real wages, which in turn are captured by changes in labour productivity. Based on Stats NZ data, we assume that the change in labour productivity since 2010 has been 1.2% per annum. Accordingly, the WTP adjusted to 2019 dollars is $14.47.

In the additionality scenarios (50% or 100%), we also assume that the park visit is an activity that is additional to other activities that a visitor would have done in the area in the absence of the park, i.e. the additional travel costs are zero. Number of visitors

A proxy for the number of visitors that could visit a waterfront park can be the number of visitors to the Viaduct or the Auckland Domain Park. These numbers are not directly available, so we estimate them using the 2019 Auckland Visitor Survey[10] and the latest 2019 Stats NZ Accommodation survey. We exclude international visitors, as our focus is on welfare created within the NZ boundaries.

Table 5 Proportion of visitors to Viaduct and Auckland Museum, 2019Table 5 shows the percentage of domestic visitors that have visited the Viaduct or Auckland Museum in 2019.

Table 5 Proportion of visitors to Viaduct and Auckland Museum, 2019

Type of visitor	Auckland Museum	Viaduct
Domestic	23%	30%

Source: (AucklandNZ, 2019)

We determine the number of **domestic visitors to Auckland** based on Stats NZ Accommodation Survey data for Auckland and the North Island. We estimate that 19% of Auckland visitors are domestic in origin, i.e. 548,000 in 2019. The number of these visitors is then extrapolated into the future using an average growth rate of 1.4%, derived from the average growth rate of Auckland guest arrivals between 2001 and 2019 (September).

Note that this number does not include local visitors.

4.2.4.2 Park development and operating costs

The approach here is to factor in the cost of developing a public park, so that a net benefit is obtained. The table below summarises the assumptions on capital and operating expenditures used to model total park-related costs. Capital expenditures were spread evenly across the 5 years of development (2040 to 2044).

Table 6 Assumptions for estimating park costs

Name	Value ($/ha)	Source
Acquisition cost	$0	Land is owned by Auckland Council.
Land remediation cost	$2,050,000	Panuku estimates the cost to remediate and clear the land is between $1,600/m2 and $2,500/m2. We have assumed the mid-point value.
Development cost	$1,456,560	Based on a 2017 value of $1,400,000/ha (Sparks, 2017), and an inflation rate of 2%.
Maintenance cost	$4,165	Based on 2016 opex values for H&B Orewa and Algies Bay Rodney parks as per (Auckland Council, 2017), and an inflation rate of 2%.

[10] https://www.aucklandnz.com/sites/build_auckland/files/media-library/documents/auckland-visitor-survey-insights-report-dec-2019-v2_0.pdf

4.3 Results – estimation of use benefits

Table 7 summarises the cumulative net benefits estimated over the 2040-2079 period, using a discount rate of 6% as per NZ Treasury guidance.[11] The results are shown under the assumptions of full substitution, full additionality effects and a 50% additionality effect. The results for the 50% additionality effect have been used as an input into the cost benefit analysis for this study.

We find that most of the use value benefits from alternative land use arise from productivity gains due to development and agglomeration effects.

We also observe that the consumer and producer surpluses are sensitive to the scale of development. In the 50% additionality scenario, an increase in the number of dwellings (e.g. by 10%) results in a two-fold increase (~20%) in the total economic surplus, although only half of that percentage increase (5%) in total net benefits. A 20% increase in the number of dwellings results in a 43% and 10% increase in total economic surplus and total net benefits respectively. Similarly, agglomeration benefits are sensitive to assumptions on available office space. A 10% (20%) increase in office spaces increases total net benefits by 6.2% (12.4%).

Table 7 Cumulative net benefits from alternative waterfront land development

Benefit estimated	100% substitution effect	100% additionality effect	50% additionality effect
Consumer surplus gains	Zero	$11.4	$5.7
Producer surplus gains	Zero	$3.9	$1.9
Park amenity value	Zero	$0.8	$0.4
Visual amenity value	$4.1	$4.1	$4.1
Agglomeration effects	Zero	$39.6	$19.8
Total net benefits	**$4.1**	**$59.8**	**$32.0**

Much of the focus here is on the consumption value of the alternative uses of the waterfront land, and on the potential for agglomeration effects. However, social preferences expressed suggest that there would also be some kind of cost or "loss" from a social licence perspective, if the port remains and expands. Therefore, if the relocation of the freight operations were to occur, it could be expected that there would be some benefit obtained in line with those preferences. The willingness to pay for this outcome is addressed separately in the next section.

[11] https://treasury.govt.nz/information-and-services/state-sector-leadership/guidance/financial-reporting-policies-and-guidance/discount-rates

5. Estimation of non-use amenity benefits

This section outlines the derivation of amenity values from more general alternative land use of the POAL waterfront land. We use these values as a proxy for social licence effects.

5.1 Relating social licence to amenity from alternative land use

Social licence to operate is a broad concept, only appearing relatively recently in New Zealand. The concept of social licence to operate (SLO) appears to be at the heart of the desire to relocate freight operations from their current site on the Waitematā Harbour. Sometimes called 'licence to operate' or just 'social licence', it emerged out of the need for the mining industry to recover its reputation after a series of highly publicised environmental disasters and the community conflict that followed, in the mid-1990's. SLO first appeared in New Zealand literature and media in 2012 (Edwards & Trafford, 2016).

There is currently a lack of clarity around what exactly SLO means and what its characteristics might be. Edwards and Trafford (2016) state that a common theme around what it means to have a SLO in relevant industries (e.g. mining, forestry, agriculture, aquaculture, gas and oil) is broad – ongoing local community and stakeholder approval or social acceptance of the activities of a corporation. Notwithstanding the difficulty describing in exact terms what having a SLO means, the emerging importance of the concept demonstrates the concern that society has for how our resources are developed and used.

Some components of SLO include the following (Boutlier, 2014):

- perceptions of legitimacy, credibility and fairness
- trustworthiness
- general acceptance of a project or activities
- quality and quantity of contact with organisation undertaking relevant activities
- impacts on environmental and social infrastructure.

SLO can be both tangible and intangible. In relation to the former, approval or opposition expressed by a community can be felt in significant ways, while the intangible element arises because SLO is not like a legal permit or authority to undertake activities (Edwards & Lacey, 2014).

In a New Zealand context, a review of SLO found that most New Zealanders want economic growth but at the same time they want to protect the environment as this underpins their quality of life. This result holds even if it comes at the cost of slower economic growth and jobs (Sustainable Business Council , 2013, p. 2). The authors state that:

> New Zealand consumers want business to focus on social and environmental performance, as well as profit, and say they will switch products and services if they found that a product or service was having a negative effect on the environment, people, society or otherwise behaving unethically.

Finally, the paper highlights that New Zealanders think the environmental issues that most need addressing in order to live up to our overseas marketing messages (i.e. where they see potential SLO issues arising internationally) are associated with:

- water quality of lakes, rivers and coastal areas
- farm run-off
- waste disposal
- mining impacts on national parks and forests.

5.1.1 Relevance of SLO to current study is through amenity values…

On the face of it, there may be questions around the relevance of SLO to freight operations of POAL on the Waitematā Harbour. There has not been an environmental disaster in recent memory, nor any strong sense that POAL has acted in a manner that is inconsistent with the requirements to maintain SLO.

However, there is some, perhaps additional dimension that means social licence is relevant to the freight operations where they currently are in Auckland. A survey conducted in June 2019 for the Working Group showed that up to 72 per cent of Aucklanders surveyed would prefer Auckland's cargo port to move to a new location.[12] By implication, 28 per cent of Aucklanders surveyed would prefer that Auckland's cargo port remain where it is (Colmar Brunton , 2019).

Clearly there is some support across Aucklanders for the relocation possibility. The contention here is that this support is grounded in notions of SLO. More particularly, this characterisation of SLO can be represented in terms of costs and benefits.

The dimension that most fits for the current analysis is that of amenity value, which could be described as the characteristics that influence people's appreciation of a particular area. In blunt terms, the port could currently be seen as an eye-sore whose activities consume the harbour and act as a barrier between the city and waterfront.

Removing freight operations would effectively switch the amenity value from being negative currently, to positive in future. Thus, it is possible to include SLO considerations in the current analysis by reference to possible amenity values.

[12] The survey showed that 55% expressed a preference for the cargo port to be moved, while 17% were not sure whether they would prefer the cargo port to be relocated. We have combined those two totals to derive the 72% figure.

5.1.2 ...but directly applicable values not available; inference used based on analogous figures in literature

Unfortunately, there are no 'off the shelf' amenity value figures relevant to freight operations at a New Zealand seaport that we can draw on. In the absence of directly applicable values, we looked to the literature for examples where analogous values had been calculated.

Table 8 contains a summary of the most relevant articles we were able to source.

Table 8 Summary of relevant studies valuing externalities

Source	Topic area	Finding
(Sal Salazar & Garcia-Menendez, Port expansion and negative externalities: a willingness to accept approach, 2016)	Negative externalities borne by local residents from port expansion (Valencia, Spain)	Median willingness-to-accept the consequences of port expansion of €121.66 per annum per household
(Sal Salazar & Garcia-Menendez, 2005)	Non-market benefits of an urban park (Valencia, Spain)	Residents closer to the park derive benefits that are 44 per cent greater than those residents with lower proximity
(Fleming & Ambrey, 2011)	Valuing scenic amenity using life satisfaction data (Australia)	Willingness-to-pay of AUD$12,000 per household per annum to obtain a one unit improvement in scenic amenity
(Fransico, 2010)	Valuing aesthetic (i.e. visual) improvements (Philippines)	Households are willing to pay US$29-US$32 on a one-off basis to remove billboards
(Sal Salazar & Garcia-Menendez, 2003)	Valuing the environmental improvements of redeveloping port areas for recreation purposes (Castellon, Spain)	Mean individual willingness-to-pay of 7,475 pesetas
(Giacarria, Frontuto, & Dalmazzone, 2016)	Valuing externalities associated with energy infrastructures (Piedmont Region, Italy)	Mean willingness-to-pay per individual of €1,148

The port expansion study by Saz-Salazar and Garcia-Menendez (2016) identified the following problems perceived by residents as a result port expansion or operations:

- visual impact
- land reclamation
- land reclaimed from the sea
- nuisances affecting nearby residents (e.g. noise, pollution, congestion).

Of particular interest to this study is the finding that the most important concern for survey respondents in that study is the 'reclamation of land from the sea' problem. Unfortunately, their

empirical estimates of willingness-to-accept negative externalities from port expansion is not disaggregated by the type of problem.

Other notable findings from the studies are that:

- the main approach used is contingent valuation, to elicit willingness-to-pay (WTP) or willingness-to-accept (WTA) measures
- results are highly sensitive to survey methods and models used, raising concerns around generalisability
- the ability to control for well-known potential biases is mixed
- the results of the studies are a contribution to a growing area of research, rather than the final word
- relevant values (either WTP or WTA) are non-linear with respect to incomes and proximity to the activities or proposal under study.

While acknowledging these caveats, we see merit in attempting to translate findings to the current enquiry.

5.1.3 Port-related studies most relevant, supplemented by scenic amenity insights

Of the studies in the table above, two are port related. Both studies are by the same authors, for port expansion in Valencia and redevelopment of dockland areas for recreation purposes in Castellon. The former study uses a WTA approach while the other uses a WTP approach. These studies provide a range for the monetisation of greater amenity.

We start with initial values of 7,475 Spanish pesetas (in 2003) for the WTP of individuals over 18 for redeveloping dock land for recreation purposes and €121.66 per annum per household WTA (in 2016) for port expansion. Using available income growth figures and purchasing power parity exchange rates we were able to convert these amounts to New Zealand dollar equivalents in 2019.[13]

We then aggregated these household estimates by applying the values to Auckland on a relevant household basis, by using the total estimated number of households in Auckland multiplied by the share of Aucklanders who preferred the freight operations to move. Based on census data, for 2001-13 we assume a constant annual growth rate for household numbers in Auckland and project that out 60 years. We then calculate the present value of the stream of calculated benefits to arrive at figures for the possible benefits felt by Aucklanders as a result of relocation of freight operations. These figures sum the values from 2045, as that is the year after no further freight operations will take place as modelled in the analysis.

[13] https://databank.worldbank.org/indicator/NY.GDP.MKTP.CD/1ff4a498/Popular-Indicators# https://coinmill.com/ESP_EUR.html#ESP=13472

5.2 Results – estimation of non-use amenity benefits

Table 9 shows that the present value of potential amenity benefits that could accrue to Auckland households would lie in the range of $820 million to $1,007 million. This study uses the mid-point of this range for the CBA.

Table 9 Key parameters for estimating amenity value range

	Low	High
2019 NZD values (Household WTA or WTP)	$310.13	$380.81
Total number of households in Auckland	540,000	540,000
Proportion of Aucklanders who want freight port to move	72%	72%
Relevant households who will derive benefit (2019)	388,800	388,800
Average annual growth rate of HH's 2001-2013 (Census data)	1.7%	1.7%
Undiscounted total amenity value from 2045	$12,601m	$15,473m
Present value total amenity value from 2045 (6% discount rate)	**$820.2**	**$1007.1m**

Given the nature of the method used and the subject matter of the proposal, it is possible that such amenity benefits could arise prior to the modelled date when operations cease. That is, just knowing that operations are going to cease may result in benefits to households once the announcement is made. If we assume an announcement is made in 2020, then the present value of amenity benefits would fall in the range of $2.8 billion-$3.4 billion.

We note that these figures treat Auckland households as homogeneous (i.e. proximity to the harbour site is not factored into the analysis). We also assume, for consistency purposes, that individuals under the age of 18 are not relevant to the valuation as was the case in the other studies.[14]

While an approximation only, we are comfortable that the values estimated give a broad sense of the potential amenity benefits relevant to freight operations removal from the current site.

For the purposes of the CBA, we have used a mid-point value of around $914 million in present value terms for the social licence/indirect amenity value benefit. This figure is added to the $5 million in direct amenity values to derive the total amenity value benefit of $919 million presented earlier in the report. To this value we add the agglomeration benefits to business productivity and the non-market gains to consumers and producers to estimate total economic benefits from alternative land use.

[14] Thus, the individual amenity value estimated was multiplied by two to get a household value, based on the average size of an Auckland household being three and the share of the Auckland population aged 18 and under being around a third. https://www.stats.govt.nz/tools/2018-census-place-summaries/auckland-region

5.2.1 Using Australian figures on scenic amenity value raises potential benefit to over $2 billion; viewed as implausible

For the sake of comparison, we used the same basic calculation method for the Australian WTP value in 2011 of $12,000 per household for a one-unit improvement in scenic amenity (e.g. from very low to low, or from low to medium). After inflating that value to 2019 terms and applying across estimated relevant households in Auckland in 2045, we generated a figure of $2.046 billion in present value terms for potential amenity value benefits. This is essentially a one-off, single year estimate as the one-unit improvement is not expected to accrue each year. Assuming that households would benefit as soon as the announcement was made, this present value figure is estimated to be $5.769 billion.

In our view these estimates are highly questionable. The approach requires Auckland households to be willing to pay what is in effect over 10 per cent of average household income for the year-ended 30 June 2019 (i.e. average household income was $120,381) in a single year. Such an amount seems to us implausible, given the availability of scenic amenity in the immediate vicinity of the current site and the harbour more generally. Such figures are more illustrative rather than instructive.

5.2.2 Offsetting effects at other ports not factored into analysis due to unique features of Auckland site

Given the estimates used in this part of the work draw on studies estimating the WTA port expansion and/or WTP for redevelopment of dock land areas, it is natural to question whether the communities in the regions where relocation might happen have offsetting impacts. That is, while Auckland households might gain from having the harbour site used for purposes other than a port, in regions such as Northland and the Bay of Plenty, households might not be as willing to accept port expansion. In other words, there is no net benefit to society as a whole because relocation merely transfers costs to other regions.

We make two related points that support a view that there are real benefits from a move and not a transfer as such. The first is that we are using port expansion or dock land redevelopment as a form of proxy for amenity, which is itself a proxy measure for social licence. Expansion is an incremental concept whereas cessation of freight operations completely is a binary concept. In our view, there is likely to be a significant difference between the two concepts that makes precision difficult, especially in the time available for this work. Further, in the case of redevelopment of former dock land, that is either not feasible or desirable in the alternative port locations.

The second, perhaps more important point is that the current site is in the heart of Auckland's CBD with significant foot traffic with the Waitematā Harbour often referred to as 'the jewel in Auckland's Crown.' The current port sites in Northland and Bay of Plenty do not share the same characteristics as the existing Auckland site; it is unlikely that there would be the same sentiment towards the current port sites in those regions. Similarly, the proposed Manukau and Firth of Thames sites would not seem to be held in as high regard.

On balance, we consider that while the prospect of offsetting costs to other locations is a theoretical possibility, in reality, we are probably on safe grounds in not including such potential costs in the analysis.

6. Conclusions

This report uses a total economic value framework to identify the plausible economic benefits from alternative uses of the waterfront land under a scenario where the POAL freight operations are relocated elsewhere. The benefits identified are grouped into use benefits and non-use amenity benefits. The results of the estimation of these benefits are included in the cost benefit analysis.

The benefits from the alternative use of the waterfront land, under mixed-use assumptions, include productivity gains from agglomeration, economic surpluses from the creation of new dwellings (apartments), visual amenity value to North Shore residents and the amenity value of a new public park for domestic visitors to Auckland. These use benefits are estimated to be between $4 million and $60 million, in present value terms, over the period to 2079. For the purposes of the CBA, we have used a value of $32 million, in present value terms.

The most substantive benefit estimated here is for the social licence / indirect amenity value. The present value of the potential amenity benefits that could accrue to Auckland households over the period to 2079 is estimated to lie in the range of $820 million to $1,007 million. While this is an approximation only, we are comfortable that the values estimated give a broad sense of the potential amenity benefits relevant to freight operations removal from the current site. For the purposes of the CBA, we have used a mid-point value of $914 million, in present value terms, for the social licence / indirect amenity value benefit.

The potential changes in revenue from property rates and land leases would represent financial impacts for Auckland Council but they are not economic impacts from a societal perspective and so should not be included in a cost benefit analysis. Furthermore, a material net financial benefit to Auckland Council appears to be unlikely under plausible assumptions.

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Appendix A: Long list of benefits considered

Direct use value

Nature of benefit	Type of user	Benefit description
Consumer surplus	Resident	Gains in consumer welfare due to new supply of waterfront apartments, with a corresponding impact on the price of that category of dwellings
Avoided cost of commute	Worker	CBD residents with jobs outside of CBD under the BAU scenario now live close to their workplace. This is captured by the consumer surplus
Visual amenity for residents	Resident	Residents derive amenity benefits from waterfront views from their property. This is captured by the consumer surplus
New profits	Property developers	New profits to property developers
Consumer benefit due to more variety of trade	Retailers	Availability of differentiated stores can add consumer benefit – also known as the "variety effect" [15]
Visual amenity for non-residents (e.g. North Shore)	Wider public	Non-residents derive amenity benefits from the new harbour skyline

Indirect use value

Nature of benefit	Type of user	Benefit description
Agglomeration	Worker	Improved accessibility or relocation of firms/workers (from outside city) makes places denser, resulting in increased productivity
Increased labour supply	Worker	Reductions in commuting costs implies an increase in effective wages, incentivising more people to enter the workforce
Move to more productive jobs	Worker	Improved accessibility may induce workers to change their location of work. A worker's new "effective wage" is higher due to higher productivity

Option use value

Nature of benefit	Type of user	Benefit description
Amenity from public spaces for residents	Resident	Residents derive amenity benefits from having the option to visit the public space
Amenity from public spaces	Wider public	Visitors derive amenity benefits from having the option to visit the public space

Non-use value

Nature of benefit	Type of user	Benefit description
Existence value	Wider public	Auckland residents derive amenity benefits from knowing that the public space is in the proximity of their dwelling. For residents in the new waterfront apartments, this is captured by the consumer surplus
Amenity from public spaces Bequest value	Wider public	Auckland residents derive amenity benefits from knowing that the public space is a new green asset for future generation. For residents in the new waterfront apartments, this is captured by the consumer surplus
Civic pride	Wider public	Auckland residents derive civic pride from a modern waterfront development that encapsulates the feature of a modern urban lifestyle

Appendix B: Benefits excluded

Worker avoided cost of travel (substitution scenario)

This benefit was excluded as it requires assumptions on where the BAU workplace would otherwise be. Given the distant future over which benefits are assessed, determining where the BAU workplaces would be is not realistic.

Economic surplus from additional dwellings to meet increased workforce demand

If we assume that the new waterfront space results in a net increase in workforce (e.g. as assumed to determine upper bounds of agglomeration benefits), then there would be an increased demand for residential dwellings in Auckland. Some of this demand could be covered by the new 5,500 waterfront dwellings, but some would either be covered by additional supply (if supply is relatively responsive to market signals) or by displacing existing residents (e.g. due to increased pressure on prices and rents). New supply would add further gains in economic surplus, whereas displacement would simply reflect transfers of wealth. It is impossible to determine which effect would dominate as this requires making assumptions about the housing supply market in the distant future. We therefore exclude this estimate.

Retail variety effect

The retail variety effect could be measured by assuming an iso-elastic demand for products (constant elasticity). Denoting this elasticity σ, the value of any variety effect is equal to the change in expenditure divided by (σ – 1). The literature suggests estimates of σ from other contexts to be in the range 6 – 10, i.e. a wider benefit mark up of 10-20% of expenditure in the development (Laird & Venables, 2017, p. 12).

We exclude this effect because we do not have enough information to make assumptions about the type of retail that will emerge, and in what mix (e.g. cafes vs shops).

Additional taxes resulting from increased labour supply

Benefits from increased labour supply are measured by the additional tax on the marginal increase in wage, on the basis that additional tax can be used to fund other socially desirable projects (Dobes, Leung, & Argyrous, 2016).

We exclude additional taxes arising from higher effective wages because taxes are transfer payments within a CBA context. The accepted reasoning is that the value to society from the additional social spending is about the same as the loss in consumption opportunities as a result of the tax (i.e. that these offset each other, including factoring deadweight costs).

> It is usual practice to ignore gainers and loses who are parties to transfer payments, such as taxed, subsidies and welfare payments. This is merely for convenience, because the benefits to the recipients are assumed to be offset by the costs to the payers. The cash component of a transfer does not involve the creation or destruction of resources ((NZ Treasury, 2015, p. 10).

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'Sapere' comes from Latin (to be wise) and the phrase 'sapere aude' (dare to be wise). The phrase is associated with German philosopher Immanuel Kant, who promoted the use of reason as a tool of thought; an approach that underpins all Sapere's practice groups.

We build and maintain effective relationships as demonstrated by the volume of repeat work. Many of our experts have held leadership and senior management positions and are experienced in navigating complex relationships in government, industry, and academic settings.

We adopt a collaborative approach to our work and routinely partner with specialist firms in other fields, such as social research, IT design and architecture, and survey design. This enables us to deliver a comprehensive product and to ensure value for money.

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