



BRIDGING FINANCE

ARE WE PAYING FAR TOO MUCH
FOR INFRASTRUCTURE?

We need major investment in new roading infrastructure, but are New Zealanders being unwittingly fleeced of billions in the process? That's the question **IAN WISHART** attempts to answer as he compares the cost of Auckland's proposed new harbour crossing with similar projects overseas



You hear the numbers being batted around in the news so much that it's easy to become immune to them: \$3.9 billion, \$5.6 billion, \$6.7 billion. They represent various costings for either a new harbour bridge for Auckland, or a harbour tunnel.

Throw in government reports of either \$2.8 billion for the Waterview tunnel first proposed for Helen Clark's Mt Albert electorate, or \$1.4 billion for a surface motorway on the same route (and eventually \$1.4 billion for a tunnel again, at half the original planned length). Then add \$2.4 billion for the proposed central rail tunnel, \$2.5 billion for a highway between Pakuranga and Onehunga. If your eyeballs aren't rolling around in your head by now like the lemon icons on a one-armed-bandit at Sky City, you're probably already comatose.

It's like Monopoly, but without the chance of picking up a Community Chest card advising "Congratulations, bank makes \$15 billion error in your favour".

With all this expenditure planned, teams of boffins and corporates are drafting proposals suggesting taxpayers and road users share the capital cost burden, with flat rate tolls as high as \$8 per trip being considered for any vehicle using the motorways.

With all this money potentially being sucked out of the public's pockets each day, you'd hope we were getting the best possible prices on our infrastructure projects, wouldn't you?

Maybe, maybe not.

A comparison by Investigate magazine of New Zealand infrastructure costs compared with similar projects in Asia, the US, Australia and Europe raises questions about just how much fat is built into the project budgets.

To set the scene, let's examine some of the biggest engineering marvels of the last two decades.



SUTONG BRIDGE, CHINA

At 8.2 kilometres long, this cable-stayed bridge spans China's Yangtze River between Shanghai and Nantong, and became the largest bridge of its kind in the world. The Sutong's two towers are 306 metres high, almost as tall as the Sky Tower. It's a six-lane motorway, like the proposed Auckland Harbour crossing, and was built by Chinese construction companies with assistance from Western engineering firms.

The industry magazine Road Traffic Technology quotes the total cost of the bridge at US\$751 million (NZ\$1bn), and describes how it was financed by a combination of tolls and taxpayer contributions. This figure is backed up by one of the German companies involved in the construction, which reported a "total cost" of the Sutong Bridge at US\$726 million. The less reliable Wikipedia "estimated" a total cost of US\$1.7 billion but now appears to have been well off the mark. It took five years to complete, and opened in mid 2008.



MILLAU VIADUCT, FRANCE

At 2.4 kilometres long, the Millau Viaduct is similar in length to the proposed second Auckland crossing, but far more complex in terms of its engineering. The highway sits a whopping 270 metres above ground – nearly 900 feet – and would be like building a bridge from fifty metres above the observation deck of the Sky Tower across to the North Shore and staying at that height all the way across the harbour. Officially, the Millau is the 12th highest bridge in the world, but its towers make it the tallest, at 343 metres (the Sky Tower reaches 328 metres).

You would think all that engineering came at a huge cost – particularly if you are working on New Zealand prices – but the French brought it in for only 400 million euros (NZ\$674 million) and it opened eight years ago after only three years in construction.



AKASHI BRIDGE, JAPAN

A 4.4 kilometres in length, it is four times longer than the existing Auckland Harbour Bridge and is officially the longest suspension bridge in the world. It straddles the Akashi Straits, where the sea is more than a hundred metres deep. By comparison, the Waitemata Harbour is less than 16 metres deep in most places. Additionally, the Akashi Bridge is in Japan's 'Typhoon Alley' where wind speeds can reach 290 km/h, and it is seismically active. To combat these engineering challenges, massive concrete towers were driven deep into the sea floor, and there's enough steel cable in this one bridge alone (300,000 kilometres of it) to stretch nearly all the way to the moon (343,000 km at its closest point), or put another way it could encircle the earth seven times.

Like the proposed Auckland crossing, this bridge is a six-lane motorway. At the time of its completion in 1998 it cost around NZ\$5 billion. It is nearly twice as long as the proposed Auckland crossing and far more challenging from an engineering perspective, required to withstand magnitude 8.5 earthquakes, 300 km/h hurricanes and monster tidal flows that rise and fall at a flow speed of nearly five metres per second.



ORESUND BRIDGE, SWEDEN

At more than 16 kilometres in length, this combined bridge and harbour tunnel route is visible from far above the earth. It links the Swedish city of Malmö with Denmark across the Baltic Sea. It carries two railway tracks and four lanes of traffic, and begins with an eight kilometre bridge from Sweden out into the Baltic, before dipping under the sea at the official marine border between both countries as a tunnel for the remainder of the journey. The total cost of the project, built in just four years, was NZ\$8 billion for the 16 km of bridge and undersea tunnel combined. A toll of NZ\$67 per car trip finances the project. It is strong enough to withstand Baltic winter storms and ice buildup, and it allows trains to travel at speeds of up to 200 km/h.



YEONGJONG BRIDGE, SOUTH KOREA

Another Asian monster, at 4.4 kilometres long, built by Samsung. This one is a double decker, carrying six lanes of traffic upstairs, and a further four lanes of traffic downstairs alongside a double-track railroad. The bridge is not only designed to withstand hurricane force winds, but earthquakes and a daily tidal rise and fall of nine metres. It's much longer than the 2.6 km Auckland Harbour Bridge option, and with ten vehicle and two train lanes also significantly larger than the six lanes of traffic proposed for Auckland. While the Auckland bridge has been costed at NZ\$3.9 billion (\$1.5 bn per km), however, this Korean giant came in at NZ\$1.8 billion, or \$413 million a kilometre – less than a third of the cost but delivering double the capacity, including rail.



LOETSCHBERG RAIL TUNNEL, SWITZERLAND

In a country ringed by granite, you'd expect the gnomes of Zurich to be good at tunnelling and they are. This 33 km railway tunnel opened in 2007 and is officially the world's longest land tunnel, and allows high speed passenger trains to fly through the ground beneath the glacier-covered mountains at Ferrari-like average speeds of 240 km/h. It's a single rail line, meaning trains have to be staggered for inbound and outbound use of the tunnel, but nonetheless it's an impressive feat to punch a 33 km hole through solid rock and still have change from NZ\$5 billion. Auckland's proposed harbour tunnel, only 2.8km, is budgeted at \$5.6 billion.



DUBLIN SEA PORT TUNNEL, IRELAND

In a bid to cut a bottleneck route into Ireland's main port, the Dublin authorities constructed a 5.6km four lane road, including "1.9 km of twin cut and cover tunnels, 2.6km of twin bored tunnels and 1.1 km of surface road along with associated interchanges and infrastructure," reported Road Traffic Technology. In other words, it's quite a bit like the Auckland project although with two fewer lanes and twice as long. The construction cost NZ\$1.2 billion for all of the above, and it opened in 2007 at the height of the Irish economic boom. A toll of between NZ\$5 and NZ\$20 is levied on all private cars and light vehicles using the tunnel (depending on the time of day). Trucks, ironically, are allowed to use the tunnels toll-free.

The relatively cheap construction price (when compared to the smaller Auckland harbour tunnel proposal) included the purchase of not one but two TBMs, or tunnel-boring machines. The largest machine, nicknamed "Grainne", was 156m long and weighed 1,600 tonnes. It chewed through solid rock at the rate of 10 metres a day and spat out 500,000 cubic metres of stone in its wake. The second machine, nicknamed "Meghan", was smaller and given the task of boring through boulder-ridden clay deposits, managing to dig out 71,000 cubic metres of earth.



I-710 FREEWAY, LOS ANGELES

Not yet constructed, this project has been costed at less than NZ\$240 million for every kilometre of triple-bore motorway tunnel, giving a total project cost of NZ\$658 million for a 2.8 km stretch equivalent to the Auckland harbour tunnel requirement.

AIRPORT LINK, BRISBANE

At 15 kilometres long, this combined motorway, busway and tunnel system also includes 25 new bridges. Nearly six kilometres of the route is through twin underground tunnels. All up, for the entire package, the bill is around NZ\$400 million per kilometre, or \$6 billion for the whole thing. Due to open this coming month, the project as a public private partnership turned into something of a disaster under former Queensland Labor premier Anna Bligh. Small mum and dad investors who'd been encouraged to underwrite the project took a bath when the value of stocks slipped to only 0.1c per share, the lowest price possible on the ASX short of being declared officially dead. Media reports focussed on the massive consultancy fees being charged to the project by companies involved in the construction consortium BrisConnections, and it was quickly shortened to "BrisCon" by a sceptical media. Even so, on a per kilometre basis the Brisbane Airport Link project is far cheaper than many of the transport projects mooted for Auckland.



GOTTHARD BASE TUNNEL, SWITZERLAND

Another massive rail tunnel system, this time totalling a whopping 57 kilometres beneath the Swiss Alps. It's a twin-bore system allowing for high speed rail traffic both ways, and it cost less than NZ\$13 billion, or only NZ\$222 million per kilometre of twin bore tunnelling which, again, would equate to only NZ\$621 million for the 2.8 km of tunnel needed to cross Auckland Harbour, not \$5.6 billion. This Swiss project also involved multiple TBM boring machines.

I-45 PARKWAY TUNNEL SYSTEM, HOUSTON, TEXAS

They're still arguing about the proposed 50km long i-45 in Houston and it is still on the drawing board, but its costs are a lot cheaper than Auckland. The plan is for two large tunnels, each capable of carrying six lanes of traffic using a double decker configuration, and with provision for rail as well. Houston authorities have costed one of the six lane tunnels at US\$160 million per mile, equating to NZ\$130 million a kilometre. This would equate to NZ\$363 million for the 2.8 km harbour tunnel.

With all the fuss around "buy New Zealand made", particularly in a recession, you can see why the Government appears to be relying on trusted and proven NZ construction companies for much of our roading infrastructure, including the proposed harbour crossing.

However, given the prices these projects are being built for overseas, it begs the question whether relying on local firms for specialised infrastructure in New Zealand isn't simply a form of expensive corporate social welfare. The construction companies have been big donors to political parties, and with multi-billion dollar contracts in the offing for what now appear to be relatively small and simple construction projects, you can understand why they might be feeling generous. It's taxpayers and road users, however, who will be ultimately footing the bill.

The Waterview tunnel, for example, has just commenced construction in Auckland and will link up State Highway 16 to the airport bound State Highway 20 with the use of a motorway and 2.5 km long tunnel beneath Waterview. The budget for that tunnel is NZ\$1.4 billion, or \$560 million per kilometre to construct. That's an awful lot more expensive than the \$130 million a kilometre they are budgeting for in Houston, or the \$222 million per kilometre the Swiss are paying to punch a twin bore tunnel through the bedrock of the Swiss Alps.

Why so expensive down under?

One Australian commentator claims

SMART TUNNEL, KUALA LUMPUR, MALAYSIA

This ten kilometre long tunnel is the longest multipurpose tunnel in the world. Multipurpose because apart from providing underground roading, it also serves as a massive stormwater drain during flash floods. The tunnel is designed so that watertight gates can shut the tunnel to traffic and allow stormwater to fill it up and drain away. Four kilometres of the ten includes roading for cars and light commercial vehicles. It took only four years to build using two TBMs, and cost only NZ\$700 million for the whole thing.

his country suffers the same mysterious problem:

"It is in the interests of the powerful Melbourne road lobby to make public transport projects appear more expensive than they are," argues Public Transport Users Association spokesman Tony Morton in a web missive entitled "Common Urban Myths About Transport".

"Private operators and suppliers also find it in their interest to inflate project costs, as it boosts their prestige to preside over a big-ticket project, and perhaps because of the old rule that the more money there is floating around, the more likely it is to wind up in one's own pocket!"

In Washington State in the US, the government ordered a comparative study in 2002 of highway construction costs across the US, with a view to getting a much better feel for genuine road construction costs. It examined the project cost of building a mile long, four lane freeway interchange, in 27 states across America. The figures are an education.¹

In 2002 dollars, the final project cost for a mile (1.6km) of four lane freeway built from scratch in the US was an average of US\$9 million, or US\$5.6 million per kilometre. Some states could do it for less, some for more, but that's the average four-lane motorway construction price in the US for 2002.

In Arkansas, the state government issued a costs guideline for road design engineers in 2009 for freeway construction showing that a six lane freeway in urban areas should cost US\$8 million

per kilometre (roughly NZ\$10.3m), while a four lane freeway through rural areas/mountains should cost slightly less.²

In the Canadian province of Ontario, two new four-lane highways were punched through at an average cost in 2011 dollars of NZ\$12 million per kilometre.

Back here in New Zealand however, the proposed Puhoi to Wellsford four lane extension will cost taxpayers and/or road users a seemingly stunning NZ\$45 million per kilometre. At 38 kilometres, the motorway extension is budgeted in today's money at \$1.7 billion, whereas in the US that same freeway would arguably cost less than NZ\$400 million.

This is not to say that outliers don't exist. Everywhere you look around the world you can find a project that seriously blew its budget and cost far more to build than the average. Nonetheless, New Zealand's figures seem routinely high rather than occasional.

One New Zealand construction consultant – preferring to stay anonymous because of his position - told *Investigate* the price differentials between New Zealand and overseas were stunning.

"I can't think of a good reason why another Auckland Harbour Bridge should cost \$3.9 billion, if a similar size bridge overseas can be built for \$200 to \$400 million.

"Sure, you might have to bring in some of the big structural segments in from overseas if you couldn't make them here, and the overseas experts are expensive, but at most that might add 50% to the cost of a job.

"Our sub-contractors and workers are paid stuff-all, so our labour costs are internationally competitive.

"The only thing that could be a factor is New Zealand's seismic requirements."

We considered that aspect, but in the highly seismic Japanese landscape, the massive Akashi Bridge has been built to withstand an 8.5 magnitude earthquake – far bigger than anything likely to hit Auckland. In fact, while the Akashi megalith was being assembled, it was rumbled by the massive Kobe earthquake of 1995 that killed six thousand people and shifted the bridge towers so much that the bridge had to be lengthened.

Likewise, the giant Yeongjong Bridge



that Samsung built in Korea is made to withstand tough natural forces as well, and came in for a fraction of the proposed Auckland crossing price, so it's hard to see how New Zealand's geotechnical problems are so unique that they justify exponentially higher project fees.

Not that you are likely to see a second harbour bridge. The preferred option for NZTA is to keep the existing harbour bridge as the only surface structure, and drill a tunnel instead. Two harbour

bridges side by side would look naff, they told journalists. They did consider building a new six lane bridge for \$3.9 billion and then demolishing the old one, but there would be no net capacity gain and the cost of demolishing the old bridge would have to be added on.

However, if the budgets were re-examined in light of what the Asians in particular have been able to build, you could probably have a spectacular new 12 lane harbour bridge with trains, and demolish

the old bridge, and probably still come away with more than a billion dollars in loose change.

Planning is still at an early stage, no design drawings have been released, and even the preferred options are still up for discussion, which means costs are indicative, not set in concrete and tied to a specific design. There's still a chance then, that some tough questions from the community could have an impact on this debate, and other major infrastructure projects elsewhere in New Zealand.

Discrepancies in the project costs may also be the product of a process that works back from the benefits. To get a road infrastructure project approved in New Zealand, a benefits-to-costs ratio greater than 4 has to be shown. In other words, if you are pitching billions of dollars in benefits, project costs can be up to one quarter of those. A study by Waikato University's Arthur Grimes and Yun Liang in 2008 estimated the \$366 million spent extending the Auckland Northern Motorway from Tristram Avenue right up to Silverdale over a period of years had

generated more than \$2.3 billion in economic benefits to the country, thus more than justifying the expenditure.

The problem, as it appears to *Investigate*, is that massive fees are being built into infrastructure projects that taxpayers then become liable for through government borrowing, or which motorists will be pinged for in tolls every day for thirty years, driving up the cost of living. The companies given the right to operate these new roads and structures stand to make a fortune, while the contractors who built them have also been paid handsomely in comparison to their overseas counterparts.

This apparent major discrepancy in roading infrastructure project costs has apparently gone relatively unnoticed in New Zealand, and that could be for

manager for Auckland and Northland, Tommy Parker, told *Investigate*.

“This is a usual procedure undertaken by the NZTA for its large transport projects, and certainly for one on the scale of an additional crossing of the harbour.

“The costs for a tunnel and a bridge are based on conceptual designs for a crossing and are indicative. They were one part of a series of studies investigating an additional harbour crossing. The studies are part of the first stage of a detailed and extensive process for a complex project. They are published on the AWHC website.

“There is a strong preference from Auckland Council for a tunnel. It will publish its Auckland Plan shortly and its preference for the tunnel reflects the community feedback it received on this.

“It is difficult to compare like for like

prices include the final design of a tunnel. Talk to date is of four single bored tunnels – two each for road and rail – but other options could include “double-decker” tunnels carrying traffic on two levels.

“The tender process to select a consortium to construct the additional crossing will also influence the final price.

“Construction of an additional harbour crossing is several years away, but planning and design work does have to start now on such a complex project – that is why the first indicative costs, and other economic and technical data, have been collated and published by the NZTA.

Further work in these areas is underway.

“The next immediate next step in this long-term project is to protect the route across the Waitemata Harbour. The NZ Transport Agency’s predecessor, Transit

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a number of reasons. Environmental groups who don’t like road construction are not likely to query the published high costs of highway construction, because it weakens the argument for public transport if road building turns out to be much cheaper. In fact, many environmental websites happily quote the highest per kilometre costs for roadbuilding that they can lay their hands on, for precisely that reason. Nor are governments and contractors likely to blow the whistle on what appears to be a mutually-beneficial working relationship.

It may be, as we have said earlier, that there are genuine justifications for why infrastructure costs in New Zealand are much higher than they are overseas. The NZ Transport Agency says there might be such justifications.

“The AWHC (additional Waitemata Harbour crossing) cost estimates were prepared in accordance with the NZTA cost estimation manual and based on the conceptual design developed to date. As part of this process the estimates were independently peer reviewed,” NZTA’s state highways

with tunnelling projects in NZ (few tunnels are constructed here) and overseas, particularly when it comes to economy of scale.

“The NZ Transport Agency will get a much more accurate picture of costs to tunnel under the Waitemata Harbour from the Waterview roading project underway in west Auckland. The NZTA is constructing 5km of motorway – 3 lanes in each direction – and half of it will be underground at a depth of up to 40 metres. The Tunnel Boring Machine for this project is currently being built in Germany.

“Waterview’s total cost is \$1.4b – NZ’s largest-ever roading project. The cost includes the two tunnels. This reflects the way tunnelling technology is changing rapidly overseas, and the impact those changes can have on prices.

“When the time comes to start construction of the additional harbour crossing the NZTA will be in a strong position to get best value for dollar. It will have the benefit of learning from Waterview and boring tunnels in Auckland conditions, and there will be NZ workers skilled in tunnelling.

“Other factors that will impact on the

NZ, lodged Notices of Requirements with the old Auckland and North Shore City Councils to protect the route in 2009. Auckland Council now has responsibility for the legal and planning process around consents for the Notices of Requirement,” NZTA’s Parker said.

It sounds promising, but you’d think the peer-reviewers on costings would have been aware of the prices of similar projects overseas, because price estimations have a huge bearing on public input and comment on different proposals. If the cost estimates are way off the mark, the entire debate can be wrongly skewed. Taxpayers and road users are, then, entitled to ask the question: are we getting bang for buck?

Only time and further heavy scrutiny may provide the answer. Taxpayers and road users are, however, entitled to ask the question: are we getting bang for buck?

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