A tipping point for action

Helen Lane

BACKGROUND

Aggregate (for example crushed stone, gravel or sand) is a fundamental input into the construction and maintenance of New Zealand's state highway and local road network. In 2015 New Zealand generated around 40 million tonnes of aggregate of which 18 million tonnes were used for road construction[1]. Aggregate represents the largest source of material used by the Transport Agency.

Nationally New Zealand has a large supply of quality aggregate material however it is unevenly distributed – with its location determined by geological conditions. In addition quality can differ within quarry sites and even between rock faces! This makes estimating future production volumes challenging.

The price of aggregate is relatively low and is in the range of about $30/tonne for high quality basecourse aggregates and $20 per tonne for marginal materials. Surfacing aggregates are the highest quality aggregates used on the road – this is reflected in their cost of $40 to $60 per tonne. As aggregate is a low cost commodity – haulage costs have a large bearing on overall cost. As a rule of thumb, the cost of aggregates doubles in price after the first 30 km of cartage[2]. As well as increased fuel costs there are also impacts on local communities from increased vehicle movements and environmental impacts such as increased CO_2 emissions. For these reasons local supply of construction materials is preferable.

There is increasing evidence to suggest that in our urban centres, and specifically Auckland, that locally produced premium (M4 and M6) supplies are being depleted. As a result of this, aggregate materials are being transported over increasing distances to meet demand. For example Auckland currently imports about a third of its aggregate material from Northland and Waikato over distances of 100km or more.

Urban encroachment has put additional pressure on aggregate supply. This problem is even further exacerbated by the long lead time required to open up new quarries, and requests to increase production to meet New Zealand planning requirements.

Most of the Transport Agency's works and services on the state highway network are outsourced. Included in contracts are conditions around prevention, avoidance and reduction in waste generation and re-using of materials on-site. The use of recycled materials can help avoid the

[1] New Zealand Petroleum and Minerals
[2] NZIER. 2013. 'Construction Industry Study – Implications for cost escalation in road building, maintenance and operation'. Report to the Ministry of Transport. Wellington: NZIER

need to mine or quarry more virgin materials and at the same time reduce the amount of waste to landfill. The Transport Agency currently allows the use of recycled materials in M/3, M/4, M/6 and M/10 specifications (details provided on the Transport Agency website). Despite this, our use of recycled materials in road construction and maintenance on highways is not as high as it could be – in part as there is a perceived risk around recycled materials not meeting specifications.

Based on current planned highway improvement projects there will likely be further increases in aggregate use, particularly in our main urban areas. Aggregate resource efficiency is a WICKED problem that the Transport Agency has been trying to address for a long time – however we have struggled to get others on board. We are now however seeing a tipping point in interest – so what has changed?

WHAT HAS CHANGED?

In August 2016 the NZ Transport Agency Board members requested information around what trends were being observed in the prices of inputs (aggregate and bitumen) to the state highway maintenance and construction activities. Based on discussions with bitumen suppliers no issues that would dramatically affect supply were identified, however the availability of premium aggregate that meets the performance criteria for road surface or pavement construction was identified as a potential issue. There is an increased recognition of the need to future proof the supply of resources being used in construction. There is also increased interest from economists that can see that increasing transportation costs could have a large impact on project cost – and what is affordable from the National Land Transport Fund.

A lot of research has been undertaken around the use of recycled materials in road construction. Many alternative products meet specifications, and the more these are used the more widely this will be recognised by industry.

The University of Auckland is also currently undertaking research into the treatment of marginal materials. Marginal materials are considered aggregate grades that do not meet all specified requirements. A number of treatments can be applied to marginal materials to enable them to meet in- service performance requirements. The increased use of marginal materials would assist with the sustainable use of premium aggregate grades. Economic theory would suggest that as we see price increases of virgin aggregate materials we will see increased use of alternative and substitute materials.

WHERE ARE THINGS AT?

The Transport Agency tested our thinking with a group of technical experts earlier in May 2017. The technical group broadly confirmed the issues and approach to gain wider government input into the discussion.

A document is currently being prepared that defines the problem and identifies work required. It is intended that this work could input into the Ministry of transports research strategy which outlines the priorities for research in the transport sector as a whole.
The Agency's technical specialists are also developing a case for change - currently the Transport Agency's specifications for state highways are used by most local authorities on lower volume roads. The Transport Agency is looking to develop more fit for purpose specifications that can be used by local road controlling authorities.

ACTION STILL REQUIRED!

The sustainable use of aggregates is a multi-disciplinary, multi-agency and national issue. The Transport Agency is one of many users of aggregates. Moving forward it will be important to ensure that national decision making is integrated with regional and local planning and considers the independencies between the sectors. Does New Zealand need a national strategy around the sustainable use of premium aggregate?

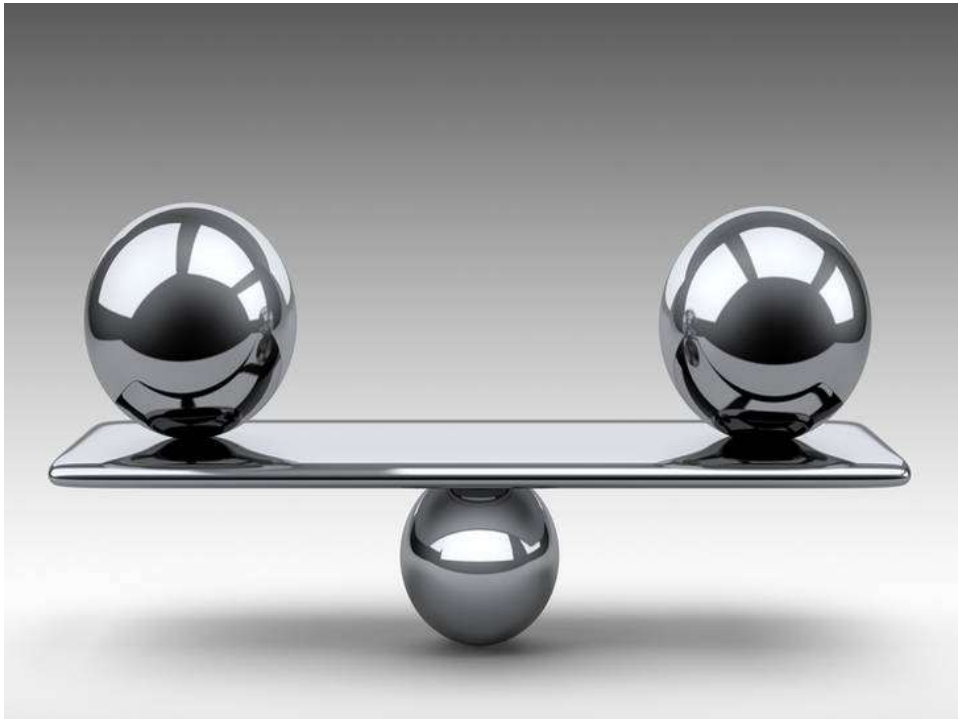
A lot of work is still required, this could include:

- Further analysis of supply and demand of premium quarry resources and identification of other uses of aggregate resources
- Further research around the use of marginal and recycled materials and reducing the barriers to uptake
- Review of current planning and legal protection around quarry resources
- Economic analysis of supply and demand issues and how we better consider whole of life costs within decision making.

CONCLUSIONS

There are huge opportunities for New Zealand to better manage finite premium aggregate resources. As Charles Darwin once said *"It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change."* The time for change is now – and it will take a collaborative multi-agency approach to address this WICKED problem.

A tipping point for action



EIANZ Conference

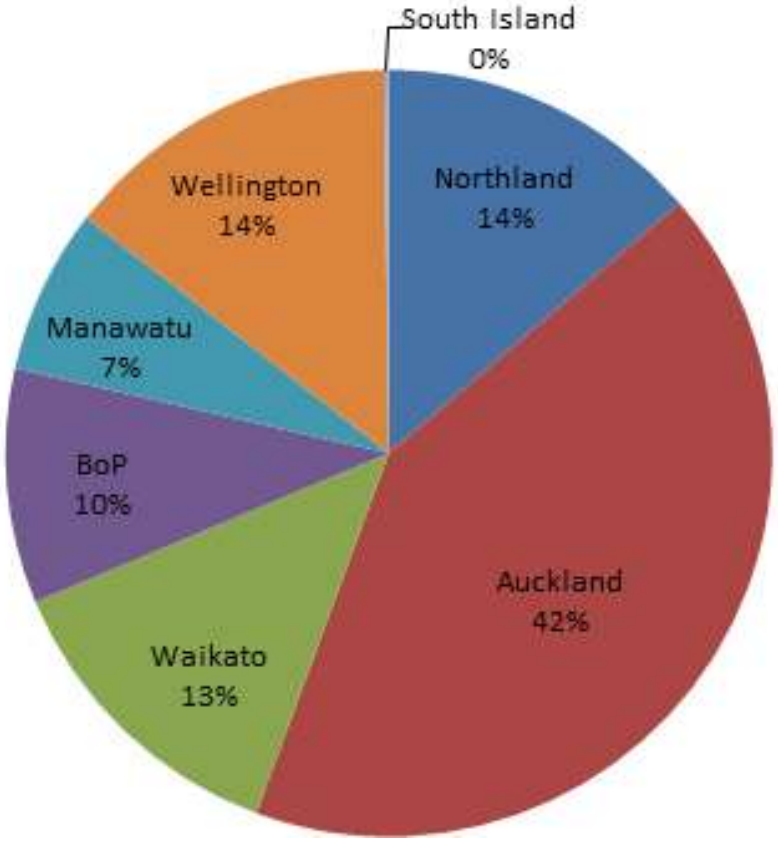
Presented by: Helen Lane

Background/context

- Aggregate is a fundamental input into the construction of roading infrastructure
- Premium aggregate grades = M4 (Basecourse aggregate) and M6 (sealing chip)
- Aggregate is a finite resource
- To future proof it needs to be used sustainably

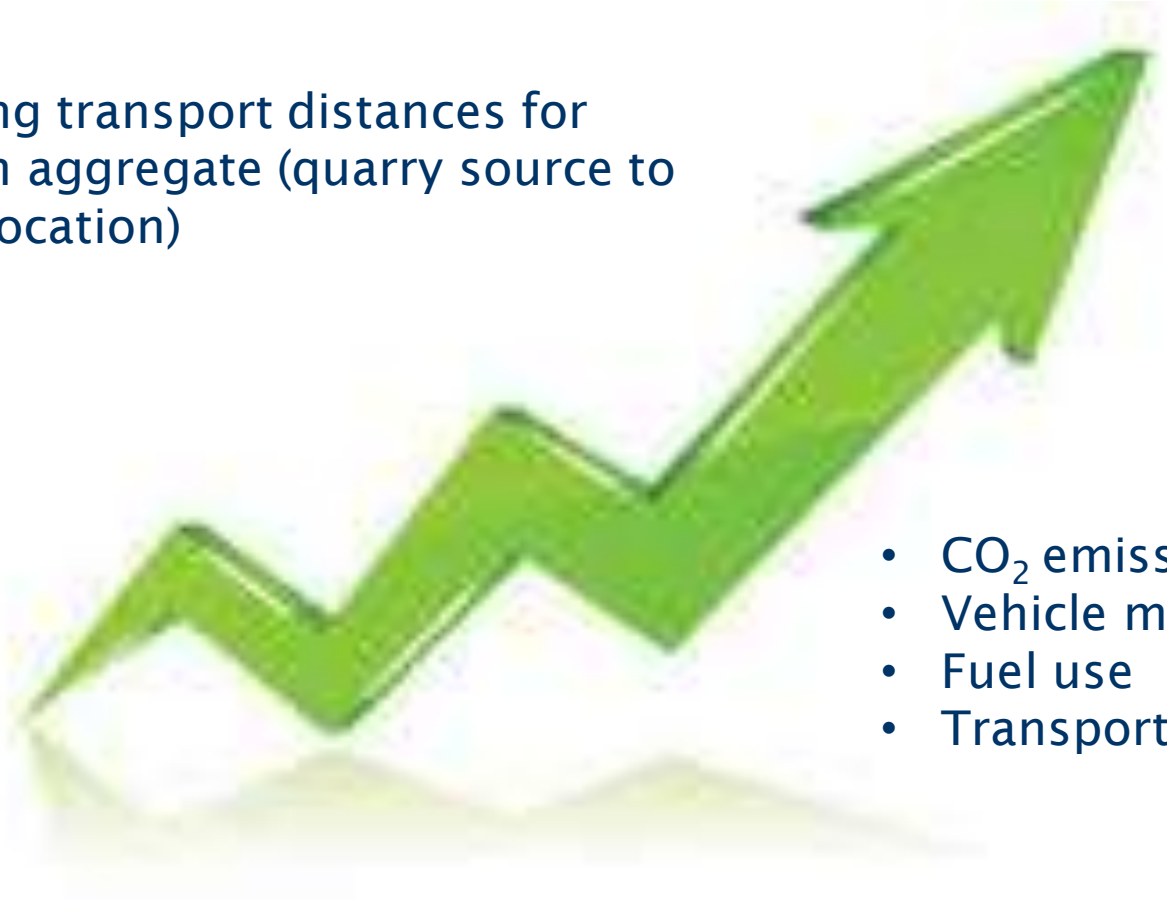
Increasing aggregate use

- Based on currently planned highway improvement projects we are projecting an increase in aggregate use
- A majority of these projects (70%) will be in the Auckland, Northland and Waikato Regions

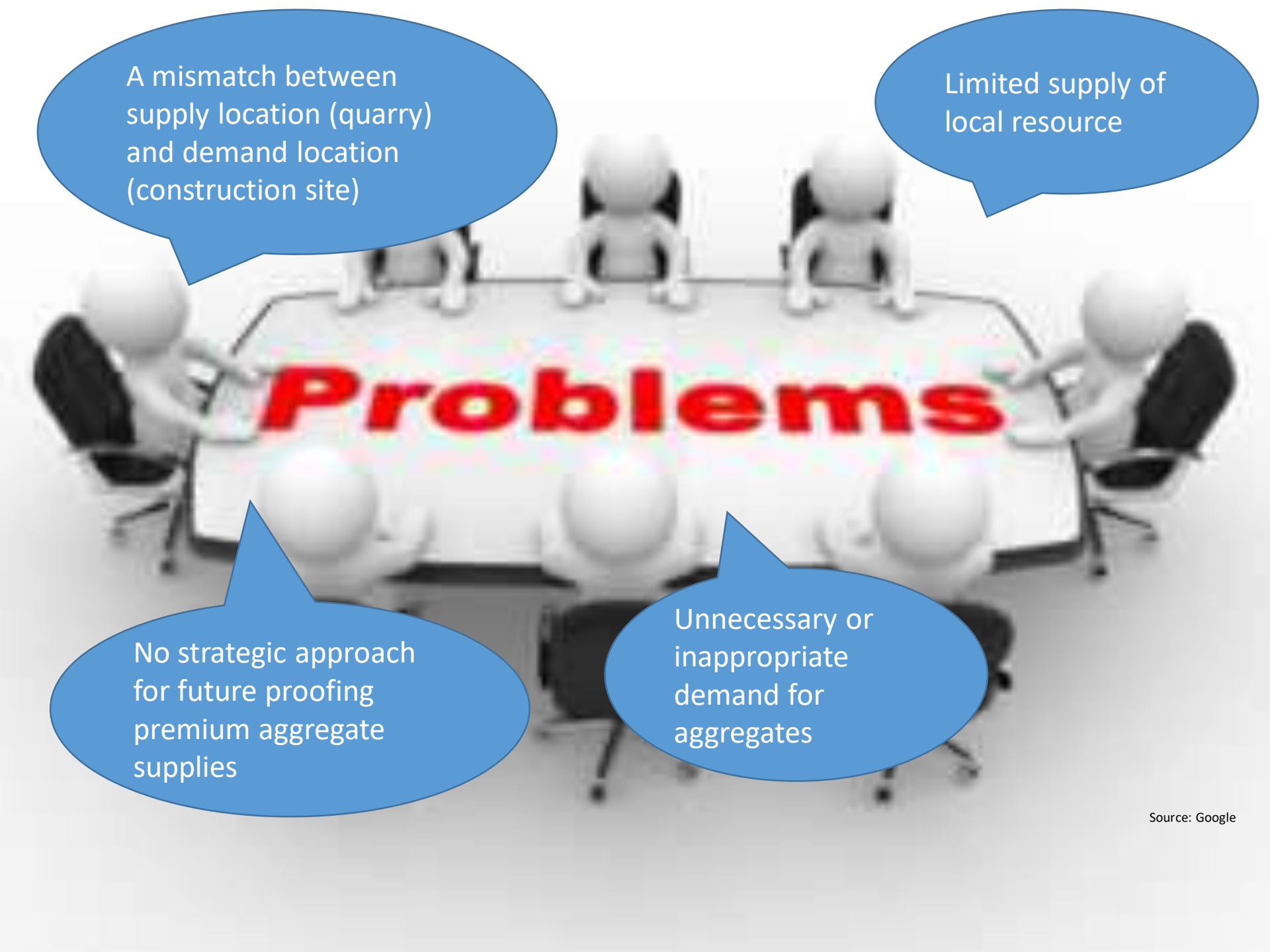


What are the trends we are seeing?

Increasing transport distances for premium aggregate (quarry source to project location)



- CO_2 emissions
- Vehicle movements
- Fuel use
- Transport costs



Source: Google

Limited use of recycled materials in NZ road construction

- Use of recycled or marginal aggregate is low
- Landfilling of C&D waste is still possible at low cost, in some areas, making recycling of aggregate less attractive
- Perceived risk of product variability in recycled material
- NZTA specifications often used for non-state highways

Planning issues

- Development pressures on quarry sites
- Regional and local planning documents
- Vehicle movements from quarry sites

What has changed

- NZ Transport Agency Board interest
- Research
- Cost drivers

Where are things at

- Working to clearly define the problem
- Raising the profile
- Identifying future work required
- Developing fit for purpose specifications

Action still required!

- Further analysis of supply and demand
- Review of planning and legislation
- Encouraging the use of marginal and recycled materials
- Economic analysis of supply and demand issues
- Better consideration of the ‘true’ costs within decision making