



Cross-curricular teaching activities in the Learning Areas of Science, Social Sciences, and Technology with links to English and the Visual Arts, brought to you by ...

## TUNING INTO QUARRYING AGGREGATE?

- Discover your students' current knowledge of quarrying by posing the following questions:
  - what is a quarry and what takes place in a quarry?*
  - what materials are taken out of quarries, what do we use these materials for and how important are they?*
  - how are these materials taken out of a quarry?*
 (Revisit this section for evaluation after completing the unit)
- Do students know that the main materials we take out of our (mainly) open quarries are forms of crushed rock which we call aggregate. As a class discover the following at: <https://teara.govt.nz/en/rock-limestone-and-clay/page-1>
  - the crushed rock (aggregate) that makes up the bulk of the products we quarry in New Zealand (rock, limestone & clay)*
  - some everyday uses for these aggregate products in our cities, roads and our houses.*
- Have groups work through the sources, uses and types of aggregates sections to discover their many uses in everyday life and in industry. Can they expand on the many different ways that aggregate can be/was used in roading, housing, building construction and industry, both in the past and at present? **eg**
  - What are some of the dozens of everyday uses for concrete and how did early Māori use aggregate?*
- Have the class work through all the pages of the website (including images) to discover further uses of aggregate, **eg** how limestone is used in agriculture, how clay can be used to produce works of art, pumice used to stonewash jeans ...



## WE ALL DEPEND ON AGGREGATE

- Introduce the concept that everybody, every day, all around the world, depends on aggregate. How true do students think this is? Play the first 1 min-3 seconds of the following video (filmed in Toronto) <https://www.gravelfacts.ca/video101/> to have students discover the major part that aggregate plays in our everyday lives. List all the uses highlighted.
- Challenge individuals, groups and/or the class to conduct in-depth investigations to discover the dozens of ways aggregate is used at school, at home and in their local community,

Have students share their findings with the class, **eg** roads, house bricks, footpaths, walls, tennis courts, driveways, patios, buildings, airport runways, monuments, drains, skateboard bowls, art works, sculptures ...

- Challenge students to speculate on how our everyday lives would change if we didn't quarry and use aggregate.
- Have students, take lots of photos, paint pictures, add captions and create a large wall display and share their findings on the everyday 'importance of aggregate' with other classes.

## CHALLENGES FOR THE FUTURE

- Tell students that aggregate producers around the world face many challenges in the future. The challenges faced in Toronto and Ontario are almost identical to those in New Zealand and Australia. Use the following discussion points to explore these challenges at: <https://www.gravelfacts.ca/video101/>
  - why the demand for aggregate will only increase in the future and how this demand will met*
  - identifying new uses for aggregate in the future*
  - the pressure caused by increased population*
  - why would people be opposed to new aggregate quarries opening close to where they live*
  - what is meant by the 'not in my backyard' attitude that many people have about quarries*
  - why you can't just dig a quarry anywhere*
  - the advantages of having a quarry close to the users*
  - why we should always use the very best aggregates*
  - actions that are taken to protect water and the environment*
  - the % of productive farmland used for quarries*
  - what happens to quarries once they are no longer in use - discover examples of 'rehabilitation'.*

## QUARRYING IN AUSTRALIA & NEW ZEALAND

- Remind students that no matter where aggregate quarrying is carried out, the industry still faces the same challenges. Tell students that the next video is from Australia, our neighbours.

The roads and buildings of our cities are all constructed from quarried materials. Crushed rock, sand and cement are mixed together to form concrete – the main material in most buildings. Roads too are mainly constructed using crushed rock (aggregate).





Visit the website of **Cement, Concretes and Aggregates Australia** at: [www.ccaa.com.au](http://www.ccaa.com.au) (select > Industry, select > overview). Play and discuss the video 'How quarries benefit Australia'. Focus on: importance to the economy, why they should be close to cities/towns, what regulations they have to meet, how the quarry works and what happens to the quarry after all the aggregate is extracted (how it is rehabilitated).

- Visit the **Aggregate & Quarry Association of New Zealand** at: [www.aqa.org.nz/resources/AggregatesFacts2015.pdf](http://www.aqa.org.nz/resources/AggregatesFacts2015.pdf) and discover the following:
  - what would happen to New Zealand if we didn't have an on-going supply of aggregates?
  - how many tonnes of aggregate per person do we produce every year? How does this compare with other countries?
  - what is over a half of our aggregate used for?

- how many jobs in New Zealand rely on producing aggregate?
- what would happen to the cost of NZ aggregate if we shifted our quarries further away from towns?

#### SHARE/DISCUSS THE FOLLOWING NZ FACTS

- Our population will rise to between 5.3 and 7.9 million by 2060. This will require 1,000,000 houses to be built over the next 40 years – that's 25,000 new houses per year.
- To build an average house we use 110 tonnes of construction aggregate and 53 cubic metres of concrete.
- To build 1 km of a two-lane highway we require about 14,000 tons of construction aggregates (400 truckloads)
- We need to plan ahead and protect our aggregate supplies so we can supply affordable houses for Kiwis and for building and repairing New Zealand's infrastructure.



From this



to this

After 130 years as a quarry, Halswell Quarry in Christchurch has been restored to a beautiful park for the community to enjoy!

#### FOCUS ON REHABILITATION

- Do students know that as the resources are quarried out, these parts of the quarry are brought back to their natural state. Tell students that this is known as 'rehabilitation' and this means every year that thousands of trees are planted and any waterways or wetlands are restored in quarries.
- Introduce the idea that in many quarries in New Zealand are often far better after rehabilitation than they were in their natural state.
- Use the following videos and websites to explore and enjoy some New Zealand quarries that have been rehabilitated...

... and turned into beautiful areas the community and visitors can enjoy and be very proud of.

- Tell students that many rehabilitated quarry sites also provide habitats for birds and other threatened species.
- Tauranga Te Puna Quarry Park at: [www.youtube.com/watch?v=D2PfTuiMg1Q](http://www.youtube.com/watch?v=D2PfTuiMg1Q)
- Whangarei Quarry Gardens at: [www.youtube.com/watch?v=kRRpW-KE-Zw](http://www.youtube.com/watch?v=kRRpW-KE-Zw)
- Haswell Quarry – Christchurch [www.youtube.com/watch?v=7JRX3qJCkbM](http://www.youtube.com/watch?v=7JRX3qJCkbM)
- Isaac Conservation & Wildlife Trust – Christchurch [www.isaacconservation.org.nz](http://www.isaacconservation.org.nz)
- Eden Garden – Auckland [www.youtube.com/watch?v=wjCG1KQ2BbM](http://www.youtube.com/watch?v=wjCG1KQ2BbM)
- Waitakaruru Arboretum sculpture park – Waikato [www.youtube.com/watch?v=KkAFxjWDer8](http://www.youtube.com/watch?v=KkAFxjWDer8)

## ROCK OUR FUTURE SCHOOL PROJECT COMPETITION FOR YEARS 5-8

- Prizes:** 4 x prizes of \$1000 for the winning schools in each of years 5, 6, 7 and 8  
4 x prizes of \$100 for each of the winning students in each of years 5, 6, 7 and 8
- Task:** Students are challenged to design a solution for the production of aggregate, including crushing plant and mobile vehicles for the 21st century that use sustainable sources of energy, i.e. 'not fossil fuels'

**Details:** For full details, timeline and entry form visit: [www.aqa.org.nz/resources/Rock\\_our\\_Future\\_Project2019.pdf](http://www.aqa.org.nz/resources/Rock_our_Future_Project2019.pdf)

Teachers and students are invited to make contact with their local quarry for information and assistance with their project competition. This could include a quarry visit or classroom visit.

For further information and assistance contact Wayne Scott at: [wayne@aqaa.org.nz](mailto:wayne@aqaa.org.nz) or 021 944 336



THE AGGREGATE & QUARRY ASSOCIATION OF NZ