



Minimising environmental impact: Air quality

Key Learning Area	Unit or lesson title and main focus questions	Most appropriate level and suggested number of lessons
 Science	Minimising environmental impact: Air quality in Sydney How will Sydney Metro Northwest be good for the environmental air quality of Sydney?	Stage 4
		2-3 lessons
 Geography		Stage 4-5

Teacher briefing

Students explore how Sydney Metro Northwest will enhance the environment. They calculate the approximate efficiency of catching a train versus the bus or driving a private car.

Requirements for these lessons

- Internet connected computers
- Tally sheets
- MS Excel or any spreadsheet software
- Station design images from Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 6 – Project Description – Operation. (See web links).

Key terms and vocabulary

Environmental impact, carbon footprint, emissions, air quality, beneficial, detrimental.

Web links



Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 6 – Project Description – Operation

https://www.sydneymetro.info/sites/default/files/07_Ch_6_Project_Description_-_Operation_-_Part_1_of_2.pdf%3Fext%3D.pdf

Sydney Trains website: ‘Why is rail travel a better choice for the environment?’

<https://www.transport.nsw.gov.au/projects/environment-and-safety/sydney-trains-environment-and-sustainability/why-rail-travel-a>

Syllabus links

Science 7–10

SC4–10PW describes the action of unbalanced forces in every day situations.

(PW4) Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations.

Students:

- (b) research ways in which scientific knowledge and technological developments have led to finding a solution to a contemporary issue, e.g. improvements in devices to increase the efficiency of energy transfers or conversions.

Geography K–10

Geography Stage 4 – Place and liveability

- the impact of environmental quality on the liveability of places
- strategies used to enhance the liveability of places.

(GE 4–1) locates and describes the diverse features and characteristics of a range of places and environments

(GE4–2) describes processes and influences that form and transform places

(GE4–3) explains how interactions and connections between people, places and environments results in change

(GE4–7) acquires and processes geographical information by selecting and using geographical tools for inquiry.

Geography stage 5 – Changing places:

- the causes and consequences of urbanisation
- the management and planning of Australia’s urban future.

Environmental change and management (urban environments)

- human-induced environmental changes across a range of scales
- the causes, extent and consequences of the environmental change
- the management of the environmental change.

(GE5–2) explains processes and influences that form and transform places and environments

(GE5–3) analyses the effect of interactions and connections between people, places and environments

(GE5–7) acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry.

Learning experiences

Step 1 – Class activity

Review the design of the Sydney Metro Northwest station shown in Figure 2. The diagram can be found in the pdf, Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 6 – Project Description – Operation.

https://www.sydneymetro.info/sites/default/files/07_Ch_6_Project_Description_-_Operation_-_Part_1_of_2.pdf%3Fext%3D.pdf

Students identify those design features that will contribute positively to the environment and reduce the visual impact of the rail network on the environment.

The above ground station is planned with state of the art technology. Students describe the positive aspects of the station feature in a table with the headings as shown below.

Design feature	Positive impact
Bicycle parking	Encourages riding to the station improving health and fitness of citizens.

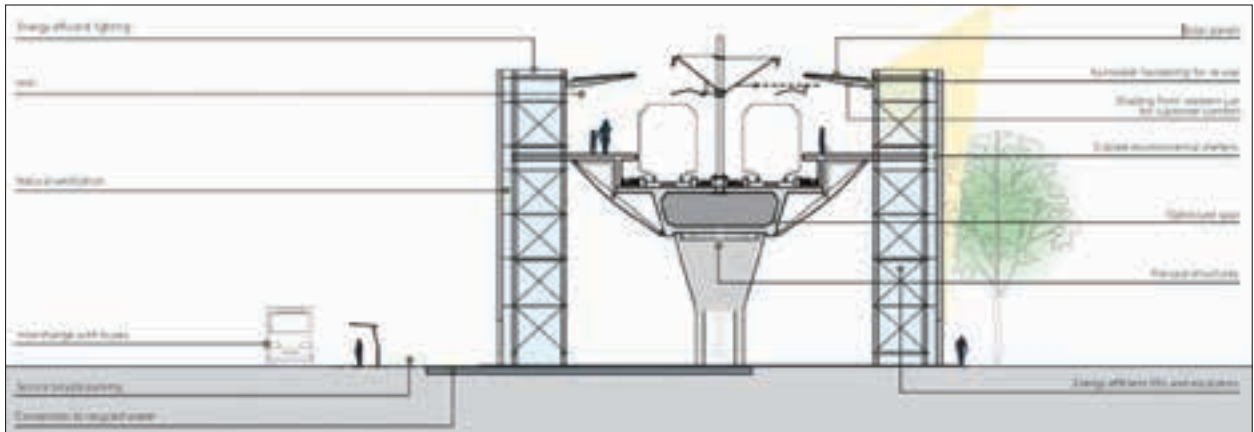


Figure 2: A generic railway station on the skytrain viaduct.

Source: Sydney Metro Northwest *Environmental Impact Statement 2*, Chapter 6 – Project Description – Operation, page 21. (See web links).

Step 2 – Class activity

Teacher prints copies, displays on the interactive whiteboard or directs students to the Sydney Trains website.

Students use the information in the chart to determine the approximate efficiency of catching a train versus the bus or driving. Why do you think the number of cars can vary between 250 and 1000?

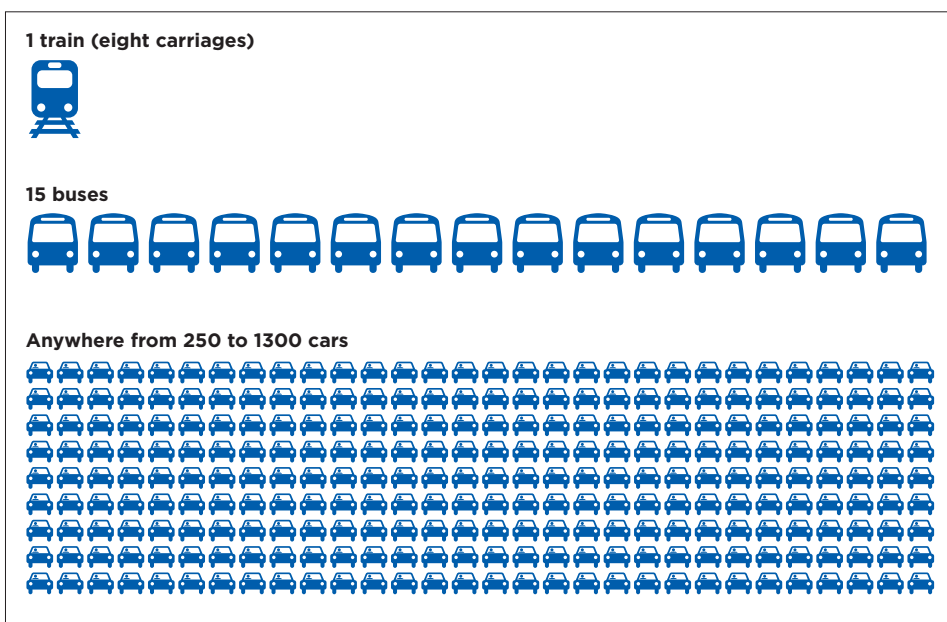


Figure 3: What does it take to move 1000 people?

Source: Sydney Trains website.

Topic Three:
Planning, designing
and building a railway

Step 3 – Homework: Data collection

Students conduct a survey of the number of passengers in cars on a nearby road. They should take a sample of 50 cars and try and record the passenger numbers. They might have some trouble determining passenger numbers per car, but encourage them to make their determination as accurate as possible. This exercise should only take about 15 minutes if it is a main road.

N.B. All New South Wales road safety rules must be obeyed at all times.

Record data in a tally table like the following:

Cars	1	2	3	4	5	6	7
Passengers							

Step 4 – Record and discuss data

Students copy their data to a spreadsheet program such as Excel and draw a chart to demonstrate the frequency of passenger numbers they recorded.

- What was the most common number of passengers in a car?
- Ask students to explain again why the number of cars can vary between 250 and 1000 in the diagram. (Answer: Because of the wide variation in numbers of people per car).

Step 5 – Individual activity

Go to the website <https://tripgo.com/>

TripGo shows door-to-door transport options across Greater Sydney as well as how to get to places in the fastest, cheapest and most environmentally friendly way.

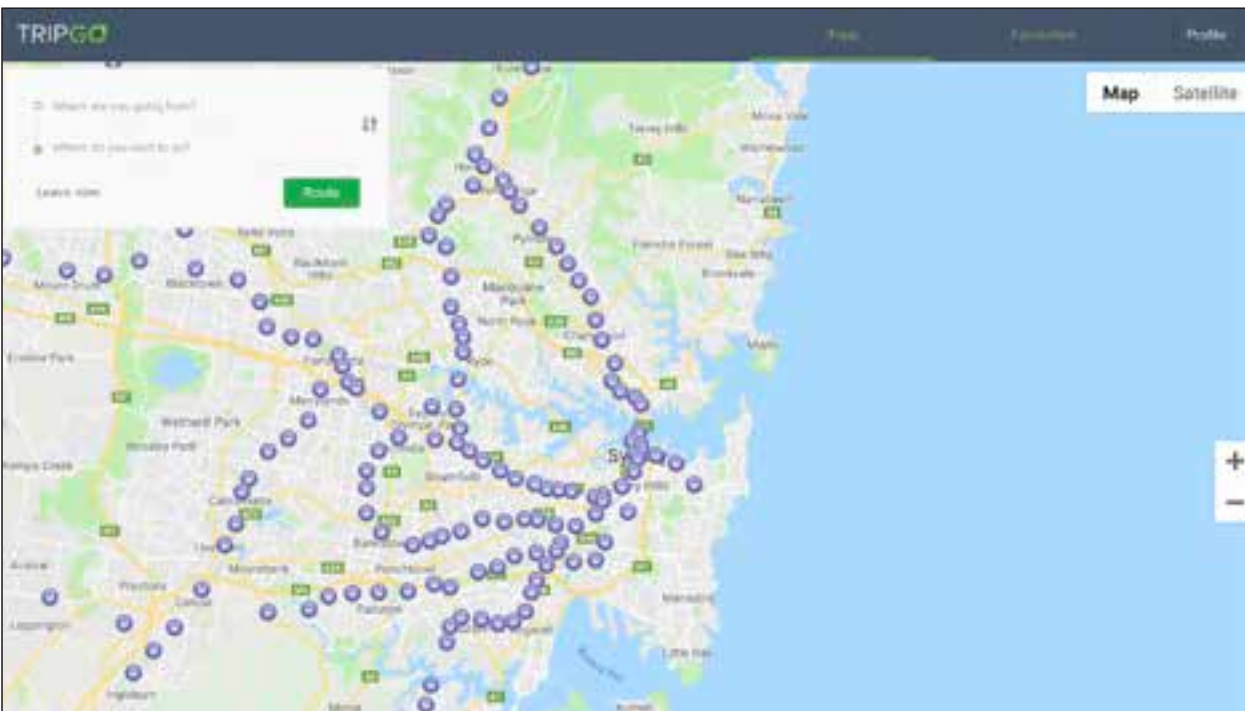


Figure 4: Transport for NSW Tripgo carbon calculator.

Instructions to students

- Identify a journey you are likely to make by car in the next few months. Compare the carbon footprint made by your journey with that of a train covering the same route. Use the calculator at <https://tripgo.com/>
- How does the amount of fuel consumed and the emissions produced compare to those generated by the train?
- Identify the real benefits to the environment that individual train use can provide as opposed to other types of transport. Individual benefits might include things such as reduced cost of the journey
- In performing your calculation on the website, identify the inputs that you can vary. List these inputs
- What assumptions are made in the 'How to calculate' section of the website when comparing journey emissions and costs?
- Look at the sample journey from Blacktown to Central Station and compare these journeys if made by the transport modes shown. Describe the advantages and disadvantages of travelling by each mode of transport for the environment and the individual
- List the things that might encourage people to catch a train or bus rather than travel by private vehicle
- Identify the reasons as to why some people would still travel by private car rather than travel by train
- Describe the benefits that Sydney Metro Northwest will bring to the greater city of Sydney
- Can you think of other personal advantages of rail travel? Hint: Reading, doing homework.

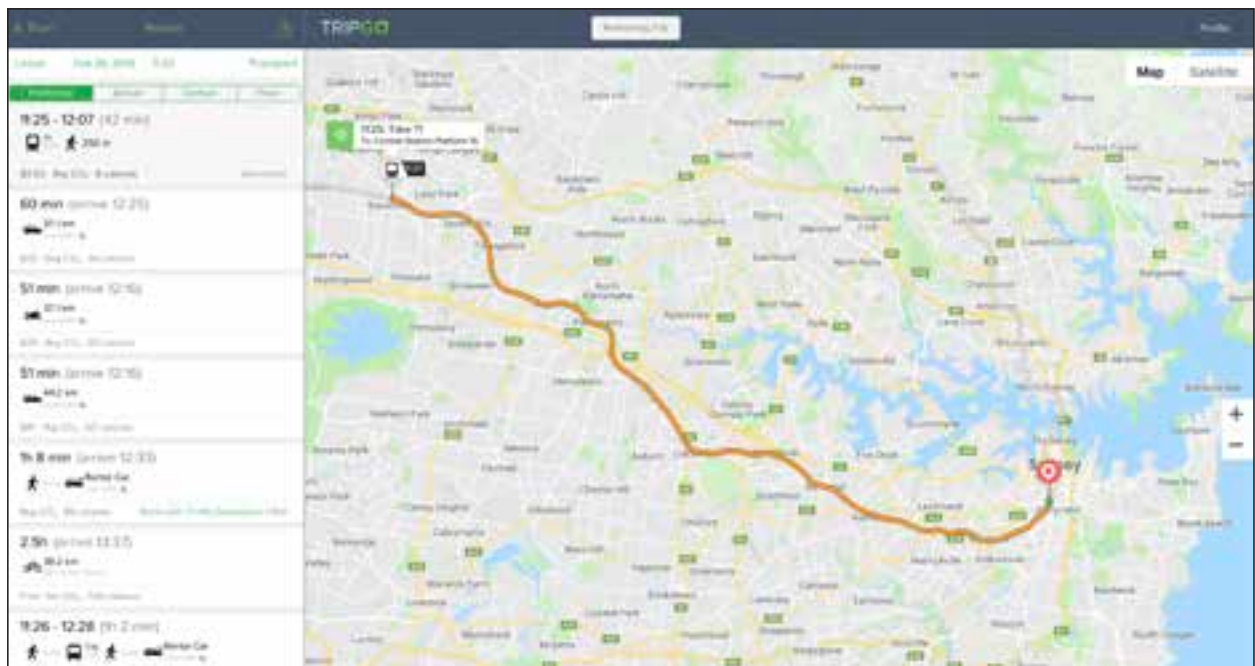


Figure 5: A journey from Blacktown to Central is comparable to a journey from the North West region to the city. **Source:** Transport for NSW Tripgo carbon calculator.

<https://transportnsw.info/apps/tripgo>



Topic Three:
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and building a railway