**ACTIVITY: Drive it Down! – climate change and carbon cycle quiz**

**Activity idea**

In this activity, students answer questions related to greenhouse gas emissions within cities.

By the end of this activity, students should be able to:

* use reading literacy skills to locate information and answer the quiz questions
* identify some greenhouse gases
* recognise specialist vocabulary and acronyms related to greenhouse gas emissions and measurement
* discuss some aspects of the carbon cycle
* discuss greenhouse gas sources in urban areas
* discuss related mitigation strategies such as active transport/changing transport modes.

**For teachers**

***Introduction/background***

Climate literacy is needed to understand the complexities of Earth systems and climate change. There are lots of interacting systems and lots of specialist language too. The quiz in this activity introduces (or assesses) some of the key terms and concepts associated with greenhouse gases, sources of urban emissions and aspects of the carbon cycle.

The quiz was developed for GNS Science’s Drive it Down! project, which supports younger students to learn about the carbon cycle and develop student-led initiatives to reduce fossil fuel emissions.

[Drive it Down! – a context for learning](https://www.sciencelearn.org.nz/resources/3376-drive-it-down-a-context-for-learning) has additional resources and information about these topics. Most of the information needed to answer the quiz questions can be found in the pop-up boxes in [Drive it Down! – the carbon cycle and climate change](https://www.sciencelearn.org.nz/image_maps/137-drive-it-down-the-carbon-cycle-and-climate-change) and/or in the GNS Science [Carbon Cycle and Climate Change booklet](https://www.gns.cri.nz/research-projects/drive-it-down/drive-it-down-carbon-cycle-teaching-resources/%22%20HYPERLINK%20%22https:/www.gns.cri.nz/research-projects/drive-it-down/drive-it-down-carbon-cycle-teaching-resources/).

This quiz can be used as an introductory tool to gauge students’ prior knowledge or as a summative assessment. Students can use the [online quiz](https://www.sciencelearn.org.nz/embeds/185-drive-it-down-climate-change-and-carbon-cycle-quiz) or a [paper-based version](#Bookmark1). The paper-based version can be edited to suit your programme.

***Quiz answers***

|  |  |  |
| --- | --- | --- |
| 1. False 2. True 3. D 4. A 5. A 6. D 7. D 8. True 9. B 10. D | 1. C 2. A 3. B 4. True 5. C 6. A 7. True 8. False 9. True 10. True | 1. A 2. True 3. C 4. C 5. B 6. False 7. True 8. C 9. True 10. D |

**Acknowledgement**

This resource has been adapted from [resources](https://www.gns.cri.nz/research-projects/drive-it-down/drive-it-down-carbon-cycle-teaching-resources/) by GNS Science for the [Drive it Down! Measuring and mitigating school-gate emissions project](https://www.gns.cri.nz/research-projects/drive-it-down/).

**For students**

***How much do you know about the urban carbon cycle?***

1. There are no greenhouse gas emissions in cities.
2. True
3. False
4. Greenhouse gases are invisible gases that act like a blanket in the sky. They keep Earth from cooling down.
5. True
6. False
7. We produce the least amount of greenhouse gases by:
8. Burning fuel (like oil, coal and gas) to travel and heat our houses
9. Producing rubbish
10. Burps from animals (and people) making methane
11. Walking to school
12. Which gases contribute to the greenhouse effect?
13. Methane, carbon dioxide, water vapour, nitrous oxide and fluorinated gases
14. Nitrogen
15. Oxygen
16. CFCs
17. Which transport mode is the most energy-efficient for cities?
18. Bicycle
19. Car
20. Bus
21. Train
22. What are some ways to reduce greenhouse gas emissions from cities?
23. Plant more trees
24. Walk, cycle, ride a scooter
25. Promote electric vehicles
26. All options
27. Which creates most greenhouse gas emissions in cities like Auckland Tāmaki Makaurau?

A. Agriculture

B. Residential

C. Industrial

D. Transportation

1. Cities are responsible for the majority of (fossil fuel) greenhouse gas emissions worldwide.
2. True
3. False
4. What is the primary greenhouse gas in urban transportation?
5. Fluorinated gases (F-gases)
6. Carbon dioxide (CO₂)
7. Methane (CH₄)
8. Nitrous oxide (N₂O)
9. What is the primary greenhouse gas emitted by organic urban waste?
10. Carbon dioxide
11. Fluorinated gases
12. Nitrous oxide
13. Methane
14. Which one is not a greenhouse gas?
15. Carbon dioxide
16. Methane
17. Oxygen (O)
18. Water vapour
19. Which greenhouse gas has the longest lifetime (lives longer) in the atmosphere?
20. Carbon dioxide
21. Methane
22. Nitrous oxide
23. Water vapour
24. What does GWP stand for?
25. Global world planet
26. Global warming potential
27. Granny wins Pokémon
28. Greenhouse warming potential
29. GWP is a measure of how much a greenhouse gas can trap heat in the atmosphere.
30. True
31. False
32. Which has the largest GWP (traps more heat over time)?
33. Carbon dioxide
34. Methane
35. Fluorinated gases
36. Nitrous oxide
37. Which greenhouse gas is the most abundant in the atmosphere?
38. Carbon dioxide
39. Methane
40. Fluorinated gases
41. Nitrous oxide
42. Typically, atmospheric concentrations of greenhouse gases are higher in the cities than in the rural areas.
43. True
44. False
45. The ozone hole is caused by global warming.
46. True
47. False
48. During the day, plants absorb carbon dioxide through photosynthesis.
49. True
50. False
51. The oceans are one of the largest carbon sinks (absorb carbon) in the world.
52. True
53. False
54. Too much carbon dioxide in the water hurts plants and animals because water becomes:
55. Acidic
56. Hot
57. Cold
58. Sweet
59. A carbon sink is a location that absorbs more carbon than it releases.
60. True
61. False
62. A unit we use to measure the atmospheric concentration of carbon dioxide is ppm, which stands for:
63. Plays per minute
64. Points per music
65. Parts per million
66. Plants per metre
67. Which is the closest number to the current atmospheric concentration of carbon dioxide in ppm?
68. 53
69. 288
70. 419
71. 711
72. A thin layer of air (100–3,000 metres) closest to the ground is known as ABL. What does it stand for?
73. Air below light
74. Atmospheric boundary layer
75. Atmospheric blanket layer
76. Air, breeze, light
77. The ABL does not change with air temperature or time of the day.
78. True
79. False
80. The thin air layer closest to the ground (ABL) is where most pollutants and greenhouse gases are emitted and trapped.
81. True
82. False
83. Which of these is not a natural source of carbon dioxide?
84. Volcanic eruptions
85. Respiration of living organisms (plants and animals)
86. Cars and trucks
87. Oceans
88. We need greenhouse gases to survive but it hurts our planet if we have too much.
89. True
90. False
91. Concentrations of greenhouse gases that are too high can:
92. Warm seas and kill animals and plants (like coral reefs)
93. Warm the air, causing heat waves and more wildfires
94. Increase the chance of disasters like floods, landslides and droughts
95. All options