

# Chilling food activity sheet

## 39 Ways to Save the Planet

### Chilling food

This is a resource linked to the BBC Radio 4 programme *39 Ways to Save the Planet*. Listen to the episode [Chilling food](#) and complete the tasks below.

This teaching resource is designed to highlight the importance of tackling all human activity that causes climate change. Human activities like industry, transport, energy, and farming produce greenhouse gases such as carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) causing the enhanced greenhouse effect.

Therefore, advancements in transport and refrigerated transport will contribute to lowering greenhouse gas emissions. There will be multiple benefits to making transport less polluting, with the main two advantages being: improvements in air quality and the potential to reduce food wastage.

In 2018 an estimated 33% of CO<sub>2</sub> reportedly came from the transport sector. In 2021 the BBC reported that, because of toxic UK air, 6 million people over 65-years of age are at risk of lung damage or asthma attacks. Dr Nick Hopkinson, the medical director of the British Lung Foundation, estimates that between 30,000 and 40,000 people die prematurely every year from breathing toxic air.

Each year in the UK 4.5 million tonnes of food is wasted, some of which is lost due to transportation and logistical problems of getting fresh food to supermarket shelves. In the developing world the loss of food during transit is much more common. The UN Food and Agriculture Organisation estimate that around 14% of the world's food perishes between harvest and retail delivery. If food waste could be nullified, RGS-IBG expert Dr Harry Kennard estimates that this could save 3 gigatons (Gt) of carbon dioxide equivalent per year, from 2020 to 2050.

Improving 'the cold chain', quickening food transportation and developing new technologies to move food from farm to table are all critical to tackling climate change.

### What is the cold chain?

Currently there are 2.5 million refrigerated vehicles on the road worldwide in what has been coined as 'the cold chain', with the demand for transport refrigeration rapidly rising. Demand is expected to increase so much that the number of vehicles in the industry are expected to quadruple by 2030. This huge surge in demand for transport-refrigeration is a significant problem because roughly half of these vehicles run on polluting diesel engines.

There are two ways this clean transport refrigeration can tackle climate change:

1. Reducing greenhouse gas emissions from diesel engines for refrigeration (not for the truck engine, just for the container) might save 90% of CO<sub>2</sub> emissions per unit (n.b. equating to less than 0.1% of global emissions if all the 2.5 million units around the world were replaced). Improvements in air pollution would be a huge side-benefit.
2. Lowering the amount of food decomposition during transportation, especially in the developing world or hot climates would lower wastage. Globally, 50 million tons of food is wasted mostly from not having refrigerated transport. If we look at all types of food waste (a third of food is not eaten), the repurposing of farmland (i.e., planting forests on released land) and novel refrigeration designs such as the Dearman engine then between 5 and 6% of our greenhouse gases emissions could be saved.

## The Dearman engine

The Dearman engine has changed the way our food system works and is a new technology for refrigeration. The engine does not use fuel and does not require combustion — it is simply powered by sustainable nitrogen, from thin air. The machine first takes the inherent cold from liquid nitrogen (-196°C) and uses it to cool the refrigerated compartment. After this stage, the nitrogen is compressed to keep the temperature cool without the need to use diesel. This is a breakthrough for decarbonising refrigerated transport.

The process of liquefying nitrogen does require electricity, so to be fully carbon neutral a certification for green energy sourcing is necessary.

Across the globe, around 90% of transported food in the developed world is via the cold chain however, in the developing world, it is less than 10%. 3 points to note about the significance of the zero-emission engine are:

- There will be 3 billion new middle classes over the next 10-15 years
- These new middle-class lifestyles will depend on the cold chain for medicine, food, and comfort
- Up to 200 million tonnes of food could be saved each year (currently 40% of Indian and Asian harvests are lost before they get to market)

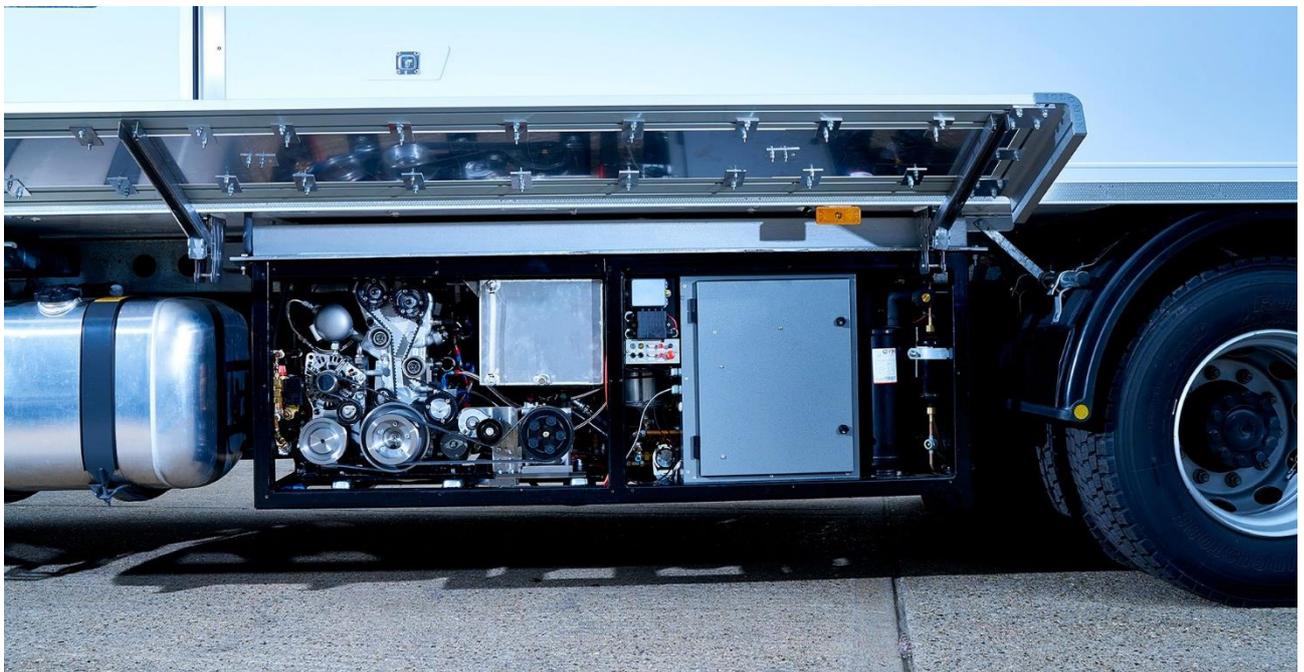


Figure 1 Clean refrigeration © Dearman <https://atlasofthefuture.org/project/the-dearman-engine/>

India is an example of a country which will benefit from improved, environmentally friendly refrigerated transport. It has a population of 1.4 billion people and a fragile food supply chain. The country stretches from the Himalayan mountains in the north to the Thar desert in the west down to the coastal plains of the south. The landmass of this 3.2 million km<sup>2</sup> country is 13 times bigger than the UK. Around 50% of the population depend on agriculture.

1. Read [India tackles supply chain to cut food waste](#) to understand the issue of spoilage, and the recent report on the impact of Covid-19 in [India's sudden lockdown threatens food supply](#). Explain why food transport threatens food security in India.



2. Use Figure 2 to annotate some of the problems of transportation with food not being cooled or under shade.



Figure 2 food transport in Casablanca © Eduardo Casajús Gorostiaga

### Further reading

- Toxic air <https://www.bbc.co.uk/news/science-environment-56013240>
- 14% food loss each year <http://www.fao.org/news/story/en/item/1310271/icode/>
- Clean cold power [Dearman: Technology firm drives a cold and power revolution - Case study - GOV.UK \(www.gov.uk\)](#)
- Dearman [Dearman: Technology firm drives a cold and power revolution - Case study - GOV.UK \(www.gov.uk\)](#)
- Dearman and M&S Hemel Hempstead <https://www.thegrocer.co.uk/marks-and-spencer/mands-rolls-out-liquid-nitrogen-powered-delivery-fleet/566747.article>
- Dearman: zero-emission transport refrigeration systems could have a major impact on air quality <https://www.greencarcongress.com/2016/02/20160226-dearman.html>
- The Indian supply chain problems [India tackles supply chain to cut food waste](#)
- Covid-19 threatens Indian food supply [India's sudden lockdown threatens food supply](#)

### Suggested questions for Chilling food

- a. What are the two climate issues with transporting food in a) rich countries? and b) poor countries in regard to transport-refrigeration?
- b. How much food does Khaled Simmons, commercial director of Clean Cold Power, say is wasted 'between farmer and fork'?
- c. What does the Dearman engine run on?

### An RGS-IBG expert

Go to [What our expert says](#) to hear further analysis from Dr Harry Kennard on the cold chain in *39 Ways to Save the Planet*.

