

- Student worksheet for case study - Green cooling



Generic green skills

Cognitive competencies:

- Systems and risk analysis, skills to assess, interpret and understand both the need for change and the measures required
- Understanding the complexity and interconnectedness of sustainable development issues and challenges

Interpersonal competencies:

- Strategic and leadership skills to enable policymakers and business executives to set the right incentives and create conditions conducive to cleaner production, cleaner transportation, etc.



Learning objective

You will be able to:

1. Understand how natural refrigerants help address global warming.
2. Reflect on the potentials and challenges of using natural refrigerants in addressing environmental issues relevant to cooling.
3. Suggest approaches for encouraging the use of natural refrigerants for cooling, based on the local context.



Format

Individual learning with group and class discussions and presentations



Resources needed

A4 paper, pens, case study



Time required

3 hours



Assessment

You will be assessed based on:

Your essay that analyzes the potentials and challenges for supermarkets/food chains in your country related to the use of natural refrigerants in cooling, and provide suggestions to encourage the use of natural refrigerants. The assessment of the essay is based on the clarity of your argument, your ability to analyze potentials and challenges related to natural refrigerant use, and your understanding about how to promote green refrigerants.

Before the class:

1. Watch the videos and articles related to natural refrigerants listed below:
 - a. Naturally Cool – The history and Development of Natural Refrigerants
<https://www.youtube.com/watch?v=Lx5jCBQik7k>
 - b. Smart Guide to Climate Change
<https://www.bbc.com/future/article/20201204-climate-change-how-chemicals-in-your-fridge-warm-the-planet#:~:text=These%20refrigerants%20break%20down%20ozone,to%2013%2C850%20times%20more%20potent>
 - c. What are Natural Refrigerants?
<https://www.gea.com/en/articles/natural-refrigerants/natural-refrigerants-climate-neutral.jsp>
2. Consider the following questions:
 - a. What is the ozone layer?
 - b. What are the effects of refrigerants on the ozone layer?
 - c. What are the different types of refrigerants?
 - d. Compared to traditional refrigerants, how efficient are the natural ones?
 - e. What are the applications of natural refrigerants?



During the class:

1. Group discussion 1 (60 mins)

- a. Group yourselves into groups of 5.
- b. Discuss the pre-class questions listed above, in “Before the class”. Each groupmate should be responsible for summarizing and presenting the ideas for at least one question, so all five questions should be covered within your group.
- c. Prepare a group presentation to share with the whole class (5 mins each group). You can use any presentation material you prefer (PowerPoint, drawing, video, etc).

2. Group discussion 2 (60 mins)

- a. Have a look at the climate-friendly supermarkets on the global map (<https://www.climatefriendlysupermarkets.org/map>) and the supermarket scorecard (<https://www.climatefriendlysupermarkets.org/scorecard>). Identify which supermarkets have used natural refrigerants for cooling globally (e.g. Aldi)?
- b. Explore what technologies/solutions related to using natural refrigerants have these supermarkets adopted (e.g. using plug and play cabinets that use R290)?
- c. Identify what are the main supermarkets/food chains in your country?
- d. Analyze the potentials and challenges for these supermarket/food chains to use natural refrigerants for cooling.
- e. Suggest some approaches/rules/regulations that could encourage these supermarkets/food chains to use natural refrigerants for cooling, such as financial incentives in tax rebates and cost subsidies.

3. Group presentation and class discussion (60 min)

- a. Organize your group ideas in a mind map.
- b. Prepare a group presentation. Each groupmate should present part of it.
- c. After each group's presentation, ask questions and provide suggestions.

4. At the end of the class the teacher will summarize the learning.

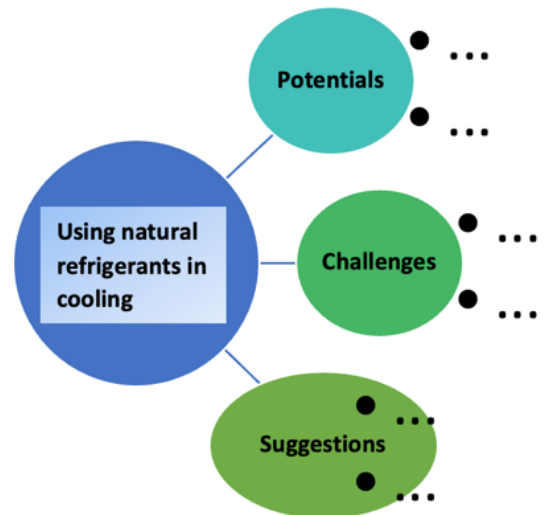


Fig. 1. Using a mind map to present your ideas

After the class:

1. Work further on the questions from group discussion 2, and do additional research if needed.
2. Submit your essay by the deadline. The essay should include the following:
 - a. A clear statement of argument – why natural refrigerants are important.
 - b. Analyze potentials and challenges for supermarkets/food chains when using natural refrigerants for cooling.
 - c. Suggest approaches/rules/regulations that could encourage these supermarkets/food chains to use natural refrigerants for cooling, such as financial incentives in tax rebates and cost subsidies.

You are encouraged to include illustrations, tables and graphs to support your arguments and suggestions.

Reference:

- Find a Climate-Friendly Supermarket Near You: A Global Tool. (2020). Retrieved from <https://www.refrigerationworldnews.com/find-a-climate-friendly-supermarket-near-you-a-global-tool/>
- Nagy, B. (2020). Natural refrigerants: Supermarkets moving quickly to adopt CO₂/ammonia systems - Plumbing & HVAC. Retrieved from <http://plumbingandhvac.ca/natural-refrigerants-supermarkets-moving-quickly-to-adopt-co2-ammonia-systems/>
- Rolfsman, L., & Tiljander, P. (2020). The impact of refrigeration technology on climate, economy and health. Retrieved from <https://celsiuscity.eu/impact-of-refrigeration-systems-technology-on-climate/#:~:text=Cooling%20technology%20is%20both%20one,and%20renewable%20source%20of%20energy>
- Theoretical view about carbon dioxide, hydrocarbons and ammonia. Retrieved from <https://natref.carel.com/what-are-natural-refrigerants> ; <https://www.green-cooling-initiative.org/green-cooling/technology>