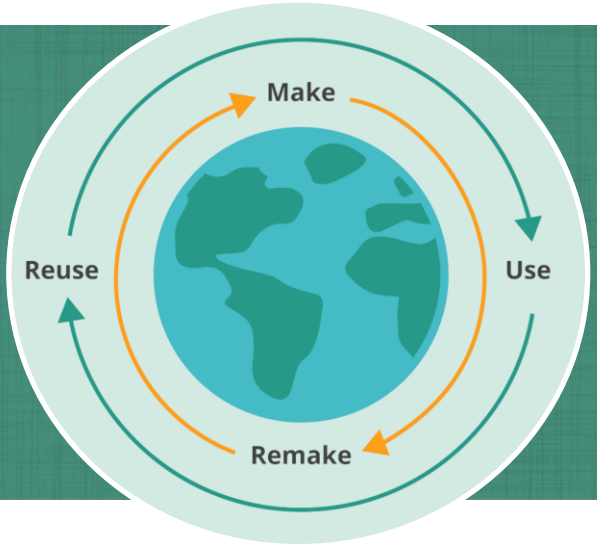
Plastic Waste to Energy



#Eco360
Activity
Grade Level: 9-12

Main Objectives

Learners will learn about chemical conversion of plastic waste into energy. Learners will explore Edmonton's Waste Management Centre, learn how the facility manages its waste and what positive impact it has on the city's environment.

Learning Outcomes

By the end of this activity, learners will:

- Describe how plastic waste can be converted into energy through chemical conversion
- Be able to describe the benefits and challenges of converting waste to energy
- Describe the role of municipalities in managing waste effectively

Curriculum Connections

Alberta

Science 30 Unit D: Waste and the Environment

- 30-D1.3k apply the concept of sustainable development to increasing the efficient use of energy

Biology 30 Unit D: Population & Community Dynamics

- 30-D2.1sts explain why Canadian society supports scientific research and technological development to facilitate a sustainable society, economy and environment

Social 10-1

- 3.7 explore multiple perspectives regarding the relationship among people, the land and globalization (spirituality, stewardship, sustainability, resource development)

Ontario

Grade 9 Biology (B1.2)
Grade 10 Biology (B1.3)
Grade 9 Geography

- E1. The Sustainability of Human Systems: analyse issues relating to the sustainability of human systems in Canada
- E2. Impacts of Urban Growth: analyse impacts of urban growth in Canada (FOCUS ON: Spatial Significance; Geographic Perspective)

Length of Activity

90 minutes

Materials List

Internet-enabled device
Topic backgrounder
Eco 360 notebook (we recommend asking learners to maintain a notebook for this program to write down reflections as they go through the program)

Step 1

Watch this video with your learners to learn about how plastics can be used to create energy:

a. Beyond Recycling: Recovering the Energy in Non-Recycled Plastics: https://www.youtube.com/watch?v=b5eX-J23_oE&feature=emb_title (5 minutes)

Step 2

In the previous video, a brief overview of how plastic can be used to create energy is explored. In this next step, introduce the process of Pyrolysis which entails

a chemical conversion of plastic waste into fuel.

a. How Waste Plastic is Converted into Fuel | Plastic Pyrolysis: https://www.youtube.com/watch?v=1STaZYZ-P1w (4:39 minutes)

Step 3

Converting plastic waste to fuel is an innovative way of dealing with non-recyclable plastic waste that ends in our landfills. However, there are cons to this process. Continue on exploring whether it is efficient to convert plastic waste to fuel. Have learners read the following article to explore co-benefits and challenges associated with converting plastic waste to fuel:

a. 'Is burning plastic waste a good idea?' article 5-minute read: https://www.nationalgeographic.com/environment/article/should-we-burn-plastic-waste

Step 4

Learners will learn about the Edmonton Waste Management Centre by visiting the links below:

a. Edmonton Waste Management Center Interactive Site Map: https://www.edmonton.ca/programs_services/garbage_waste/ewmc-interactive-site-map.aspx
   i. Click on the link to open the interactive site map of the facility
   ii. Review the map and click on numbers to explore each part of the facility, which also represents the stepwise process for handling waste
   iii. Click on step 12 - "Waste to Biofuels and Chemicals Facility" to learn about how Edmonton is turning its plastic waste into fuels
   iv. Watch this video to understand the process by which the city is converting waste to biofuels: https://www.youtube.com/watch?v=X5SjcPBLFDU&feature=emb_logo (2 minutes)

Step 5

In groups of 3 - 5, ask learners to research the waste management program in their local municipality. Have the learners compare their local management program with Edmonton's. learners will record their findings in their Eco 360 notebooks. After completing the research, have each group present their findings in class.

Step 6: Conclusion

Ask learners to answer the following questions individually or in groups:

a. Is waste to energy a sensible solution to combating plastic waste? Why or why not?
b. What role do you think municipalities play in reducing plastic waste problems in their jurisdiction?

Extension Idea

Educators may also connect with the facility directly to interview them having a set of questions prepared beforehand. Educators may also ask the facility if a virtual tour of the facility can be organized for their class.

Educators can take learners on a virtual field trip from the comfort of their own classroom or homes using the free app called 'Google Expeditions'. Educators can become guides on different locations where learners can feel immersed in VR while using a VR headset that you insert a smartphone into (cardboard viewers work just as well!). There are also options for AR, where headsets are not required, and they can just simply view the guide via their smartphone or tablet device.

a. Please watch the video 'How to Use Google Expeditions' as an educator to learn the basic mechanics: https://www.youtube.com/watch?v=pCyCnoSfQvo (3:57 minutes)
b. Once downloaded, search for the Expedition titled 'What Happens to Your Trash and Recyclables?'. This Expedition takes learners to the Sims Municipal Recycling Facility located in New York City, New York where they learn how trash and recyclables end up at important way stations before they make their way to landfills or for reuse in someone else's hands.