

Green Mining

Lesson Plan

Description

Students will learn about the roles associated with environmental responsibility at mine sites and learn how to protect the environment through planning.

Learning Outcomes

- Associate careers with environmental responsibility in mining
- Identify “green” mining techniques
- Understand environmental protection planning

Introduction

Mining is critical to modern life, but it requires extracting natural resources from the environment. Thus, great care is taken to ensure **environmental responsibility** in mining. The environment must be considered throughout the entire mining life cycle – from construction to operations to closure.

Species monitoring is an important aspect of environmental responsibility. The health and population of flora and fauna species is continuously monitored, with significant attention paid to any species that are endangered or at risk. For example, during the caribou’s annual migration in the North, all mining operations in that area must shut down for the entire duration of the migration as to not disturb the animals, which can take up to 2 weeks. Surveys of the area are also done by environmental scientists before construction begins on a site, to identify what species are in the area and what precautions need to be taken during construction. Infrastructure will not be built where birds are nesting, for example.

Great care is also taken to protect **water quality** during mining. To reduce contamination and reduce water use overall, water is often recycled on-site. Water that is released into the environment is treated to remove harmful chemicals and particulates. Treated water and the water bodies surrounding the site are continuously monitored.

Policies and **permits** are in place to protect the environment during mining. Most policies and permits are within provincial jurisdiction, however there are some federal mandates. Canada is a leader in environmental mining in policy and permitting, and mining companies must adopt the **Towards Sustainable Mining Program**. The program has many focuses, including

climate change initiatives, community engagement, tailings management protocols, Indigenous affairs and more. This was the first program in the world to require site-level reporting with external verification, with each mine having to report on 8 protocols with 30 indicators of social and environmental performance every year.

As mentioned, part of sustainable mining is engaging with the Indigenous peoples on the land. Environmental stewardship is woven into many Indigenous cultures across Canada, as there is often the perspective that all living and non-living things are interconnected. **Traditional Indigenous knowledge** has kept ecological balance throughout Canada for thousands of years. For example, Inuit communities would collect snow geese eggs in the spring. However, they always leave 1 egg in the nest because then the geese will lay more eggs to replace them. If they took all the eggs, the geese would abandon the nest. This traditional knowledge preserves the goose population. What is taken from the land is only what's needed. With this perspective in mind, mining companies must work in collaboration with Indigenous peoples to achieve environmental responsibility.

In this lesson, students will learn about how mines can be environmentally sustainable by creating their own green mines and their own environmental protection plans.

Action

Part 1: Make a Green Mine

Students will play the Mine Evolution digital game and design their own green mines. This mini game will introduce them to innovative green technologies. Scores for each student can be collected on the scoresheet.

Materials:

- A laptop or tablet

Procedure:

- Each student will need a device (laptop, tablet, or mobile phone).
- Each student will need to go to www.mineevolution.ca on their device. Click “Get the Game”. Students can download either the Google Play (Android devices and Chromebooks), App Store (Apple devices), or PC versions of the game depending on what type of device they are using.
- Once the game is downloaded, select “Challenges”.
- Select “Green Mining” and begin playing! The tutorial will show students how to play. There is also a tutorial video and a “How to Play” document with tips and tricks on the

Science North educator resources website (<https://schools.sciencenorth.ca/educator-resources>).

Part 2: Make a Protection Plan

Materials:

- Handout

Procedure:

Students will work in groups to be environmental scientists for a mining company. Students can use the handout provided to create their environmental plan. Students will have to consider all phases of mining.

Congratulations! A large ore deposit has been found during geographical surveying (see Module 1 for more information on the Exploration Phase of mining). Now we need to build our mine, but we must consider the environment while doing so.

First students must consider identify potential consequences to the environment associated with building a mine. Handout one ecosystem card to each group. The plants and animals on their cards have been identified by species surveys carried out by environmental scientists. Have the students brainstorm the following points to identify potential risks associated with their ecosystem:

1. How could disturbing the habitat affect species?
2. What are potential risks (e.g. habitat loss, noise pollution, water contamination)?
3. What can happen when one aspect of an ecosystem is affected?

Next, students must come up with a plan to mitigate these risks. Use the 4 questions below to prompt students:

1. *How can we protect the species living in the area when choosing a construction site and during operation?*

Though all species need to be accounted for in an environmental protection plan, for the purpose of this exercise, students can choose one species from their ecosystem card to create a protection plan for.

2. *How can we protect water quality during mining?*

Mining requires the use of water, and water bodies may be present around the mine site. Students can use research and use creativity to come up with a water protection plan.

3. *What kinds of green technology can we construct on our mine site to be more environmentally responsible?*

These can be existing technologies found through research or innovations from the students. The Mine Evolution game will also have provided examples and inspiration.

4. *How will we reclaim the land after the mine closes?*

After mine closure, the area should be restored to how it was before mining started. How will students do this?

5. *How can Indigenous knowledge inform their environmental protection plan?*

Lastly, have students consider an Indigenous perspective regarding environmental responsibility. Students can learn about how Indigenous peoples live in harmony with the species on their ecosystem cards.

At the end of the activity students will have created a plan that will protect the environment in 4 facets: species, water, technology, and reclamation/restoration. Each group can present this plan to the class.

Consolidation/Extension

Challenge students to take responsibility for the environment around them and plan a school yard clean up! Students will need gloves, grabbers, and trash bags. Make sure to tell students to not touch anything dangerous, such as sharp objects.

Accommodations/Modifications

Modifications can be made based on grade level. For example, younger grades can focus on the hand-out and use more creativity when coming up with solutions, while older grades can conduct greater research and present their plan using a PowerPoint.

Assessment

The handout can be collected and used as an Assessment of Learning if you wish to evaluate your students in a summative manner.

Additional Resources

[Ontario Mining & Environmental Law & Regulations | MineHutte - Regulatory Risk Ratings & Analysis of Global Mining Laws](#)

[How TSM Works - The Mining Association of Canada](#)