SMA Saskatchewan Mining Association

Lesson: Sustainability - Decision Making

Overview

Students will learn about the three pillars of sustainability (Society, Environment and Economy) and how they relate to each other with respect to choices made at mine sites or even choices made at home. They will discover how seemingly simple decisions may in fact be complex as our choices are all interconnected between the environment, the economy and social well-being.

Source: This activity was originally developed by L. Lesperance, K. Stewart, N. Stumborg, of Areva Resources Canada Ltd. for the Saskatchewan Mining Association's **MAP** (Minerals and Products) event.

Duration: One class

Materials:

- Sustainability Poster/Cards
- Student Discussion Handout

Instructional Method:

- Stations
- Discussion questions

Notes to Teacher:

This activity can be done with all the posters at each station (Question and Impacts) or have students consider the questions and leave the discussion of the impacts for a whole class discussion.

Learning Outcomes and Indicators

SCIENCE

Grade 4 Rocks, Minerals and Erosion

RM4.2 Assess how human uses of rocks and minerals impact self, society, and the environment.

g. Discuss the economic benefits associated with mineral extraction and refining, including related careers, in Saskatchewan.

h. Analyze issues related to the extraction and use of minerals from the perspectives of various stakeholders (e.g., company owner, employee, scientist, Elder, environmental group, and end user). (Indirect)

k. Assess their own and their family's impact on natural resources based on their current lifestyle. (Indirect)

Grade 7 Earth's Crust and Resources

ECR 7.2 Identify locations and processes used to extract Earth's geological resources and examine the impacts of those locations and processes on society and the environment.

i. Suggest solutions to economic and environmental issues related to the extraction of geological resources in Saskatchewan (e.g., managing mine tailings and pollutants; reclaiming open pit mining sites; ecological impact of pipelines; resource depletion; maintaining water quality; and increasing urbanization) (Indirect)

EC7.3 Investigate the characteristics and formation of the surface geology of Saskatchewan, including soil, and identify correlations between surface geology and past, present, and possible future land uses.

l. Assess environmental and economic impacts of past and current land use practices in Saskatchewan (e.g., agriculture, urban development, recreation, and road construction), and describe intended and unintended consequences of those practices on self, society, and the environment, including soil degradation. (Indirect)

Grade 10 Science

Climate and Ecosystems Dynamics

SCI10-CD1 Assess the consequences of human actions on the local, regional, and global climate and the sustainability of ecosystems.

a. Pose questions or problems relating to the effects of human actions on global climate change and the sustainability of ecosystems that arise from personal research. (Indirect)
b. Reflect upon your personal view of humanity's relationship with the environment. (Indirect)
e. Discuss why it is important to consider economic, social justice, and environmental perspectives when examining sustainability.
f. Select, integrate, and analyze the validity of information from various human, print, and electronic sources (e.g., government publications, community resources, and personally collected data), with respect to sustainability, sustainable development, and education for sustainable development.

Environmental Science 20

Human Population and Pollution

ES20-HP1 Investigate resource use and waste generation associated with human populations as well as methods and technologies used for mitigation or management

c. Investigate technologies which support sustainability in industries such as agriculture, forestry, aquaculture, and mining. (K, STSE) (Indirect)
d. Identify mitigation technologies and processes that have been developed to minimize the impacts of mining operations on water quality and quantity. (Indirect)

The Nature of Environmental Science

ES20-ES1 Examine the methods, mindsets and purposes of environmental science.

h. Examine how principles of sustainability (i.e., environmental, economic and social justice) are integral to environmental science.

Earth Science 30: Lithosphere

ES30-LS3 Investigate the processes and technologies used to locate and extract mineral resources and fossil fuels locally, provincially and globally.

m. Research and investigate solutions to economic and environmental issues (e.g., managing mine tailings and pollutants, reclaiming open pit mining sites, ecological impact of pipelines, resource depletion and maintaining water quality) related to the extraction of geological resources in Saskatchewan.

Practical and Applied Arts Energy and Mines 10/20/30

Module 4 Sustainability

SOCIAL STUDIES

Grade 4 Resources and Wealth

RW4.3 Assess the impact of Saskatchewan resources and technological innovations on the provincial, national, and global communities.

c. Identify the natural resources and industries found in the local community, and analyze their impact upon the community.
f. Examine the environmental impact of the development of natural resources on the local community, the province, and the world

Grade 5 Resources and Wealth

RW5.1 Explain the importance of sustainable management of the environment to Canada's future.

a. Differentiate between renewable resources (e.g., forests, fish, water) and non-renewable resources (e.g., oil, minerals) (Indirect)
b. Create an inventory of current non-sustainable practices (e.g., presence of plastics, packaging, dumping of waste into river systems). (Indirect)
c. List the possible consequences of non-sustainable practices related to the use of resources (e.g., lack of resources for future generations, endangered species, climate change).
d. Taking one resource as an example, illustrate how resource use and the extraction process of the resource affects the environment (e.g., forests, tar sands, coal, uranium, potash).
e. Give examples of policies and actions that contribute to sustainability (e.g., water conservation, informed decisions by consumers, reusing materials).

Grade 6 Resources and Wealth

RW6.1 Contribute to initiating and guiding change in local and global communities regarding environmental, social, and economic sustainability.

a. Represent through visual art, music, dance, writing, or other representation the contribution of individuals and communities to initiate change that supports sustainability. (Indirect)
b. Investigate how individual local consumer choices may affect people elsewhere in the world (e.g., child

labour, enslavement, sweat shops, consumption of scarce resources, prosperity through employment). (Indirect)

Grade 7 Resources and Wealth

RW7.3 Assess the ecological stewardship of economies of Canada and the circumpolar and Pacific Rim countries.

b. Define the word "sustainable", and discriminate between the concepts of sustainable and unsustainable as they apply to resources and industry.

c. Examine the sustainability of the economies of a selection of circumpolar and Pacific Rim countries, and propose practices which might increase the level of sustainability. (Indirect)

Source: **Saskatchewan Evergreen Curriculum**

Other:

- Students will learn about the three pillars of sustainability (Society, Environment and Economy) and how they relate to each other with respect to choices made at mine sites or even choices made at home.

Background Information (miningfacts.org)

Sustainability and Sustainable Development what does it mean?

At the core of sustainable development is the need to consider society, the economy and the environment, the "three pillars". People, habitats and economic systems are inter-related (OECD Insights Sustainable Development). These three are some of the factors a mining company looks at when considering the development of a mine site. It is not an easy task and the choices that they have to make usually involve trade-offs.

Environment

In the past mining has affected its surrounding environment, the revision of environmental regulations, advances in technology and changes in management techniques however, means that many negative impacts are now avoidable. Mining companies are making efforts to reduce the environmental impact of mining and minimize the footprint of their activities throughout the mining cycle, including working to restore ecosystems post-mining. (miningfacts.org)

Society:

The mining industry provides communities with jobs, economic growth, and improvements in infrastructure, and trained first responders.

Economy:

Mining has the potential to shape and affect economies directly and indirectly. Mining brings employment, government revenues, and opportunities for economic growth and diversification. However, market fluctuations, and resource revenues can present challenges in converting natural resource wealth into sustainable economic growth and development.

Vocabulary

economy	environment
society	sustainability

THE ACTIVITY

Sustainability Decision Making

(Discussion, Questions) (one class)

Preparation:

1. Print out a poster size version of the main poster or project it onto a screen.
2. Create several sets of the smaller posters and set up at stations around the room.

The Activity

Introduction

1. Have the class focus on the main poster. Start the discussion with the student's definition of **Sustainability**, **Environment**, **Society** and **Economy.**
2. Go over the 3 pillars (Environment, Society and Economy) and Discuss: Who/What is society? What is the Environment? What is an economy? How does the student fit into each?
3. Discuss Students thoughts about Sustainability and environment, Society and Economy. *This will be repeated at the end of the activity. Students may have a better understanding.*
4. Warm up activity. Ask three volunteers to come to the front of the class. Each volunteer receives a picture (Society, Environment, or Economy).

   Read and act out both of the Demonstrations.

The Stations

1. Divide the students into small groups and hand out the question/answer sheets (one to each student).
2. Explain that the students are all now Mine owners for a fictional mine site. They need to make some very

important decisions based on seemingly simple questions.

3. Have the students visit each of the stations, read the question/impacts, discuss with their group and come up with a group answer.
4. When time is up or all the groups are done review the possible impacts of each group's decisions using the poster pictures to help illustrate their response.

Assessment Method and Evidence:

✓ **Stations – Group discussions**

- Students will discuss the questions amongst their group and work together to come to a consensus on an answer.
- Students will discuss the impacts of their decision using information provided, will suggest impacts of their own, and prepare arguments to support their answers to the questions.

✓ **Presentation of answers**

- Students will present and be able to support their group's answers using information provided by the posters, through discussion, or research.

✓ **Question Sheets**

- Students will answer the questions as a group, each student will hand in the group's answer as well as their own answers to the questions.
- Students will be able to explain that everyone, not just mining companies, need to consider that discussions about sustainability include not only the environment but society and economy.

Resources

Mining Association of Canada**. Towards Sustainable Mining.** Available at: http://mining.ca/towards-sustainable-mining

Mining Facts Resources on mining and mining policy**. Environment, society, Economy. Available at:** http://www.miningfacts.org/Environment/

OECD Insights Sustainable Development: **Linking Economy, Society, Environment**. Available at: http://www.oecd.org/insights/41773991.pdf

Saskatchewan Research Council. **Planning for the Future – Sustainable mining.** Video. Available at: https://www.youtube.com/watch?v=DDkCcfpcBSM

Saskatchewan Mining Association. **Environment Fact Sheet.** Available at: **http://www.saskmining.ca/uploads/general_files/24/sma_environment-fact-sheet-2014.pdf**

Saskatchewan Mining Association. **Careers Fact Sheet.** Available at: http://www.saskmining.ca/uploads/general_files/24/sma_careers-fact-sheet-2014.pdf

Saskatchewan Mining Association. **Q&A Fact Sheet.** Available at: http://www.saskmining.ca/uploads/general_files/24/sma_q-a-fact-sheet-2014.pdf

OECD Insights Sustainable Development: **Linking Economy, Society, Environment**. Available at: http://www.oecd.org/insights/41773991.pdf

DIALOGUE CARDS

DEMONSTRATION 1.

IN THE PAST:
Companies (mining and others) have changed a great deal over time. Not so long ago companies were concerned about making what? **Answer: MONEY (take hold of the volunteer with the MONEY/ECONOMY picture and draw him/her in). Next, gently move the ENVIRONMENT volunteer out of the way. While doing this read** -
There are many lakes and rivers – no one will worry if we pollute one little lake;
Air pollution – no worries if our business creates a little smog as eventually rain will fall and in the process the air will be cleaned.
We can just throw everything into a landfill – no one will be concerned if we just bury all our garbage.
Next – gently move the SOCIETY volunteer away and read – There are plenty of people looking for work – if one employee is unhappy they can leave, there are others to take their place.
In the past the environment and social involvement were not as great a focus for some companies.

DEMONSTRATION 2.

NOW:
Modern companies are now very much concerned about being sustainable. **Draw all three volunteers in together and as you do so explain how companies support all areas of sustainability. For example:**
As you draw in **SOCIETY** explain: Employee professional development, benefits; Company community involvement supporting events; trained first responders.
Draw in **ENVIRONMENT** explain**:** Environment regulations must be met; Reclamation improves the environment for all. Funding for reclamation must be guaranteed to the government prior to mining.
Draw in **ECONOMY** explain**:** Mining companies pay royalties to the provincial government which are used to help pay for Education, Health Care, Roads ….. By providing jobs to people in mining as well as the local suppliers and manufacturers, money flows into the communities.

It is no longer acceptable to only be in business to make money – although making money is necessary for a company to continue. Making money is only one measure of success – supporting society and protecting the environment are also measures of success!

Student Handout

You are all now mine owners for a fictional mine site. As a group you need to make some very important decisions on how your company is going to be run.

Go to each of the three stations – **SOCIETY, ENVIRONMENT, and ECONOMY**
As a group read the question on each poster (there will be two at each station), discuss the questions and the information provided with your group and come up with a group answer.

At each station some of the potential impacts are listed. Can you think of more?

Be prepared to discuss the possible impacts of each of your decisions.

SOCIETY

1. Where will you hire employees from?

2. What are the potential impacts of hiring your workforce?

ENVIRONMENT

1. Do you modify your mine to reduce Greenhouse Gases?

2. What are the potential impacts or your choice?

ECONOMY

1. Where will you purchase your equipment from?

2. What are the potential impacts of buying your equipment from your chosen supplier?

Questions:

1. What is sustainable mineral development?

2. What other things might mining companies consider when purchasing equipment?

3. Sometimes the Board of Directors doesn't always agree on the decisions made. Did you agree with your group on all answers? If not why? Are there other considerations that need to be made?

TEACHER ANSWERS

Questions:

1. What is sustainable mineral development?
   Sustainable mineral development is the responsible extracting and developing of natural resources, to meet the needs of today without compromising future generations.

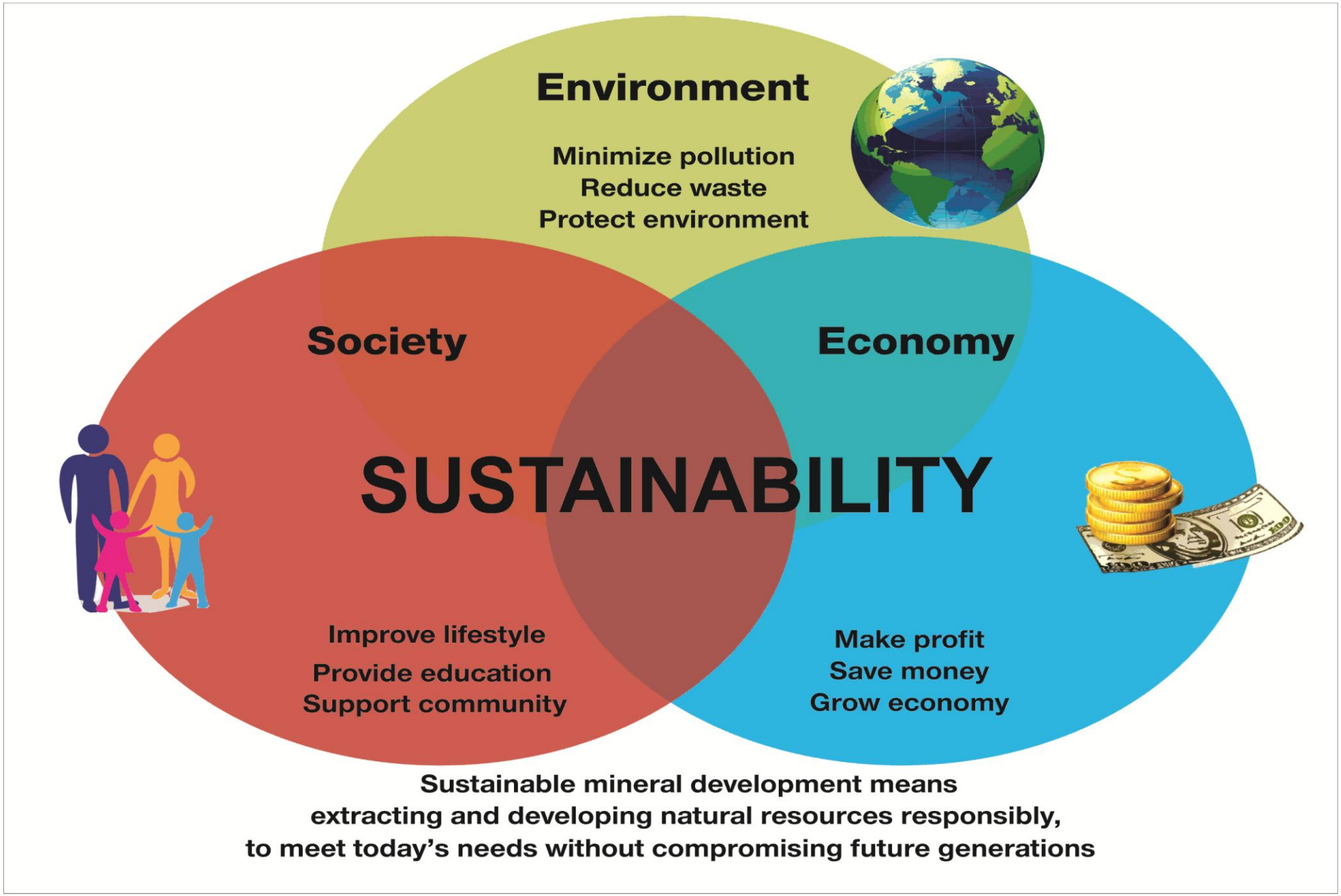
2. What other things might mining companies consider when purchasing equipment?
   Cost of the equipment, treatment of the workers making the equipment, protection of the environment where equipment is being made

3. Sometimes the Board of Directors doesn't always agree on the decisions made. Did you agree with your group on all answers? If not why? Are there other considerations that need to be made?
   Answers will vary.

SOCIETY

ENVIRONMENT

ECONOMY


Environment
Minimize pollution
Reduce waste
Protect environment
Society
Economy
SUSTAINABILITY
Improve lifestyle
Provide education
Support community
Make profit
Save money
Grow economy
Sustainable mineral development means
extracting and developing natural resources responsibly,
to meet today's needs without compromising future generations


Environment
Society
Economy
SUSTAINABILITY

SUSTAINABILITY

Where will you purchase equipment from?

For this example, consider:

- Haul trucks are needed
- Available from a Canadian or foreign company
- Often cheaper from a foreign company
- Foreign companies often have fewer environmental, and worker health and safety rules

Canadian Company?

Foreign Company?

SUSTAINABILITY

What are the possible impacts of purchase location?

From a Canadian Company:

- X More expensive to purchase
- X Longer manufacturing time
- P Boost Canadian economy
- P Strict environmental rules: less pollution
- P Strict labour rules: safe workers
- P Gives jobs to Canadians
- P Quality meets Canadian standards

CSA STANDARDS

From a Foreign Company:

- X Less environmental rules: more pollution
- X Less labour rules: workers treated poorly
- X Employs foreign workers
- X Quality does not meet Canadian standards
- P Product is cheaper
- P Quicker manufacturing
- P Money to spend on other things

Society

SUSTAINABILITY

Where will you hire employees from?

A nearby community?

The city?

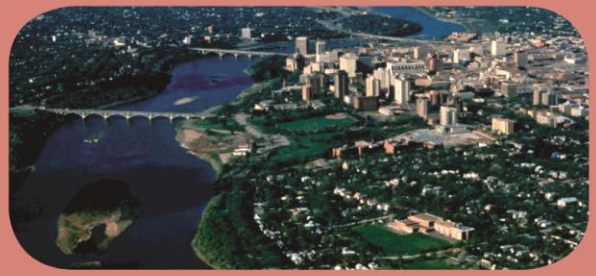
For this example, consider:

- Mine generally near small community and away from the city
- Hundreds of employees needed
- Small community has many unemployed people
- Community residents will require training
- City offers a larger number of trained workers
- City residents will have to travel longer distances

Society

SUSTAINABILITY

What are the potential impacts of hiring?



From a Small Community:

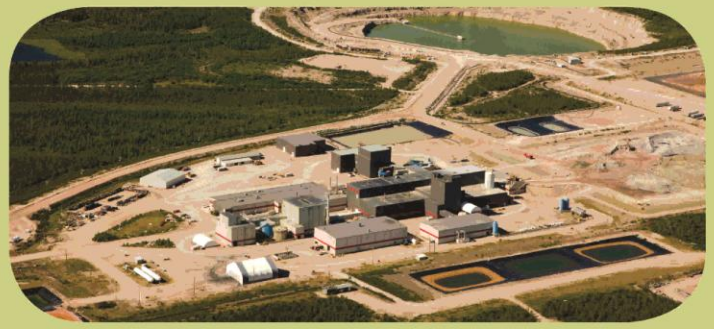
- X Employee training required
- X Lag time before employees can work
- X Mining only exists for a limited time
- P Employment opportunities
- P Community growth and stability
- P Quality of life improves
- P Company community involvement

From a City:

- X Employees must travel to work
- X Less involvement in small communities
- P Employment opportunities
- P Employees are trained
- P Quality of life improves
- P Company community involvement

SUSTAINABILITY

Environment



Do you modify your mine to reduce Greenhouse Gases?

For this example, consider:

- Greenhouse gas (GHG) emissions are harmful to the environment
- Modifying the mine will protect the environment
- Modifying the mine will cost money
- More workers are needed to modify the mine

Modify the mine?

Leave the mine without modifications?

SUSTAINABILITY

What are the potential impacts?

If the mine is modified:

- X Cost money to modify mine
- P Environment will be improved for all
- X Product will not increase in value
- P Improve company reputation

If the mine is not modified:

- X Mine contributes to global warming
- P No increase in mining costs
- X Mine impacts surrounding environment
- P Money to spend on other things
- X Mine GHGs impact future generations
- X Company reputation may suffer