



United Nations
Educational, Scientific and
Cultural Organization



MOUNT
ARROWSMITH
BIOSPHERE REGION

BIOSPHERE BOOKLETS

Lesson Plans & Activities

SUSTAINABLE CITIES

SUMMARY/OVERVIEW

Grades:
1-2

Prep Time:
30 Mins

**Learning
Environment:**
Indoor

**Total Lesson
Length:**
4.25 Hours

DESCRIPTION:

This booklet introduces the concept of five sustainability themes to students (energy, food, waste, nature, transport), and discusses the importance of these concepts within everyday life. Students will create their own 2-D model of a sustainable city, with the option of later creating a 3-D model.

CURRICULUM EXPECTATIONS:

Processing and analyzing data and information:

- Experience and interpret the local environment
- Sort and classify data and information using drawings, pictographs and provided tables

Applying and innovating:

- Take part in caring for self, family, classroom and school through personal approaches
- Generate and introduce new or refined ideas when problem solving

BACKGROUND:

Sustainable cities are designed with consideration for social, economic, environmental impact (commonly referred to as the triple bottom line), and resilient habitat for existing populations, without compromising the viability of future generations. They are committed to achieving sustainability through design and technology.

LESSON PLAN

TIME	ACTIVITY	LOCATION	MATERIALS
1 Hour	1. Introduction	Indoor	Printed worksheets
1 Hour	2. Designing a 2-D Model	Indoor	Checklist & drawing materials
2 Hours	3. Creating a 3-D Model	Indoor	Materials for 3-D model
15 Mins	4. Conclusion	Indoor	N/A

TIME

1 Hour

ACTIVITY

1. Introduction

LOCATION

Indoor

MATERIALS

Printed worksheets

Introduction: What is a Sustainable City?

GOAL: Show students how sustainability can be included in city planning.

PREPARATION: Print page 3.

LESSON PLAN:

INTRODUCTION: Initial Discussion

1. Ask students if they have heard the term **"sustainability"** before. If not, explain that it refers to a balance between using natural resources at a rate that does not deplete them, in order to not compromise the natural resources available for future generations.
2. Ask students to name **sustainable measures** they have seen before (*wind turbines, recycling bins, etc.*)
3. Hand out the **SUSTAINABILITY FACT SHEET** (page 3). Review the sheet and ensure students understand the 5 sections that must be supported in a city.
 - a. Explain terms:
 - i. **Renewable/non-renewable** - a renewable resource can replenish itself in a finite amount of time, while a non-renewable resource has a limited supply.
 - ii. **Pollution** - the introduction of harmful materials into the environment. There are many types of pollution such as air, noise, water, light and soil pollution.
4. Have students brainstorm ways that cities can address these issues (either individually or in teams).

HANDS ON: Planning Session

5. Give each team the **CITY PLANNING WORKSHEET** (page 4 and 5). Have them brainstorm ideas and complete the activities on how their city will consider each of the five issues.
(Refer to fact sheet)
6. **OPTIONAL:** If available in class they can research ways other cities have implemented sustainable measures, OR they can research methods at home for homework.



Sustainability Fact Sheet

ENERGY

- Most of the world uses non-renewable resources such as **oil and coal**. These resources contribute to global warming and climate change.
- Canada is the **world's fourth largest producer of natural gas** (non-renewable), and also the **second largest producer of hydro power** (renewable).
- 67% of Canada's electricity comes from renewable sources, and close to **95% of British Columbia's electricity is renewable**.

FOOD

- It is predicted that global food production will need to **increase by 70%** in the next 30 years.
- The cost of transporting food will increase in the coming years, so we'll need **to grow more food within or closer to our cities**.
- People will need to **grow more** of their own food and **waste less** food.

NATURE

- As our cities grow in size, there is a **decrease in green spaces** in and around our cities.
- How **natural areas connect** with large areas of concrete and asphalt can make it really difficult for animals to get around.
- Natural areas in cities **reduce pollution** and **reduce temperature**, which means residents will need to use less air conditioning (electricity).
- Cities that have a lot of natural areas have **better air quality, lower noise pollution, and happier residents**.

TRANSPORT

- People who travel into cities for work are spending more time commuting. This leads to **problems** including **stress, isolation, and obesity**.
- In Canada, **cars produce about one-third** of all Canadian **air pollution**.
- In 2016, **only 33%** of Canadians used a mode of sustainable transportation such **as buses and bicycles**.

WASTE

- A recent study stated that Canadians produce more waste per person than any other country
 - **Approximately 31 million tons of garbage every year**
 - Only about 30% of that is recycled
- Canada has **over 2,400 landfill sites** across the country.
- **Paper** takes up well **over 40% of landfill space**. Newspapers alone average about 13%.

City Planning Sheet

You have just been elected mayor to a new city and your job is to plan the city in a sustainable way. This means your sustainable city must include plans to produce **energy**, provide your citizens with **food**, minimize **waste**, **transport** people around the city, ensure there are lots of **natural** areas, and also ensure your citizens are happy and healthy. Use the questions and activities below to help guide you in planning your city!

- Energy** – All of the devices we use today use a lot of energy. We now know that resources like oil and coal are unsustainable. **Select ways you can power your city sustainably!** From the pairs below, circle which option you think would be the best.

Use renewable energy sources

or

Use fossil fuel, non-renewable sources

Allow the use of energy sucking appliances

or

Upgrade to energy smart appliances

Only use LED light bulbs throughout the city

or

Use incandescent/old light bulbs in the city

Only use fossil fuel generated energy

or

Have solar panels on all the buildings

Use solar, wind and/or hydro power

or

Use coal, oil and/or gas to produce power

- Food** – Our food production and consumption methods are unsustainable. We often transport food long distances which pollutes the environment, and we throw away lots of food. **How and where will you grow enough food for your citizens? How will you reduce food waste in your city?**

Circle the options below that will increase local food production:

More community gardens

Get more big grocery stores

More farmer's markets

Have little or no open green space in community

Have fruit trees in public parks

Encourage urban agriculture

Bring in more fast-food restaurants

Don't allow plants on balconies/decks

Teach people what they can grow at home

3. **Nature** – Our planet and people need plants and animals to survive. Consider why you might need different plants and animals in your city. **How will you make sure nature is encouraged in your city?**

Draw what a nature area in your city would look like!

List the animals, birds and plants you would find in your city!

4. **Transport** – Having too many cars on the road pollutes the environment and causes traffic and noise, which is frustrating to your citizens. Transportation may include cars, buses, trains and trams, boats, as well as walkways for pedestrians and lanes for cyclists. You need to create a perfect balance of each. **How will you help your citizens move around the city?**

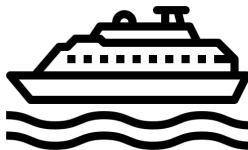
Below are several different types of transportation you could have in the city. Write beside the picture what type of transportation you think it is!













5. **Waste** – Waste in landfills decomposes and produces harmful gases which contribute to global warming. Landfills also pollute the local environment through the water, soil, and air. **How will you encourage your city to reduce their garbage?**

There are options other than the garbage for many household items. Below are some common household items. On the blank line beside them, write what could be done instead of throwing them in the garbage.

Plastic packaging and containers: _____

Food scraps: _____

Paper products: _____

Empty bottles: _____

TIME
1 Hour

ACTIVITY
2. Creating a 2-D City Plan

LOCATION
Indoor

MATERIALS
Drawing materials

Creating a 2-D City Plan

GOAL: Have students incorporate five sustainability themes into a scaled drawing of their city plan.

PREPARATION: Ensure students have paper (graph paper if available), pencils, a ruler, eraser, and pencil crayons. Print page 7 for students to use as a template.

LESSON PLAN:

PLANNING: Initial Discussion

1. Ask students to review their city plan from previous activity.
2. Have students determine what buildings and areas they think are essential for their city. See boxes to the right for some helpful hints.
 - i. If students are going to create a 3-D model (activity 3), ask them to choose what they want to include carefully, as time and materials may not allow students to have a large city.
3. Introduce students to creating a **scale drawing** (e.g. a house not being larger than a recycling centre) of buildings, along with **how to make a legend**. The legend should show the types of buildings in their city plan, based on what they have decided to include in their city.

Necessary

- Energy Sources
- Recycling Center
- Food Growing areas
- Natural Spaces
- Transportation facilities
- Houses

Other Ideas

- Restaurants
- Bank
- Hospital
- Police Station
- Fire Station
- Movie Theatre
- Factories
- Grocery Stores
- Factories
- Library

HANDS ON: Drawing Scaled 2-D City Plan

4. Have students work together or individually to create the 2-D drawing of their sustainable city. If working in a group, students can draw areas individually, cut them out, and secure to the final city plan.
 - i. Start by “zoning” areas (space for the houses, where roads will go, etc.) by outlining, colour coding, or other methods. Again, ensure the necessary elements are incorporated in the drawing.

City Name: _____

TIME
2 Hours

ACTIVITY
3. Creating a 3-D Model

LOCATION
Indoor

MATERIALS
See list below

Creating a 3-D Model

GOAL: Have students incorporate five sustainability themes into a 3-D model of a sustainable city.

PREPARATION: Gather necessary materials. Students can also bring materials from home.

MATERIAL IDEAS: Glue, paper, markers, cardboard, paper towel rolls, construction paper, tape, plastic containers. *Use recycled materials when possible.*

LESSON PLAN:

HANDS ON: Creating the 3-D Model

1. Gather students back into their groups (if applicable). Ask them to review their 2-D design and collect materials they need to create their 3-D model.
2. Students should follow their 2-D design plan; however, they may not be able to fit everything in. Ensure they include an example of energy, food, natural areas, transport, and waste collection.
 - I. Starting with a flat sheet of cardboard as the city base, students can map out roads and place buildings and other elements in the city (creating them from recycling products and securing them to the base).
 - II. Some examples include creating a wind turbine from straws, houses from a small cardboard box, or trees from cardboard tubes.
 - III. Students may draw a building on paper, cut it out and secure it to the base of the city.
 - IV. For templates that students can cut out, download the **"Templates for City Building"** PDF from the MABR Teaching Resources Page.
 - V. For more ideas, visit the following links:
 - i. <https://www.youtube.com/watch?v=VqwSHTOpvOY>
 - ii. <https://www.youtube.com/watch?v=HyBGoOFYY8o>
 - iii. <https://www.pinterest.ca/pin/205687907953801293/>
 - iv. <https://i.pinimg.com/originals/b6/35/ea/b635eacc17ce4d3a75789c8ee7cfb4eo.jpg>

TIME
15 Mins

ACTIVITY
4. Conclusion

LOCATION
Indoor

MATERIALS
N/A

Conclusion

Wrap-Up Discussion

1. Ask students what sustainability means to them now.
2. Have students reflect on their experience of designing a sustainable city.

Consider asking:

- a. What was their favourite part of designing a sustainable city?
- b. What were some of the challenges?
- c. How could their own community make changes to be more sustainable?



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or email it to the MABR Coordinator at



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