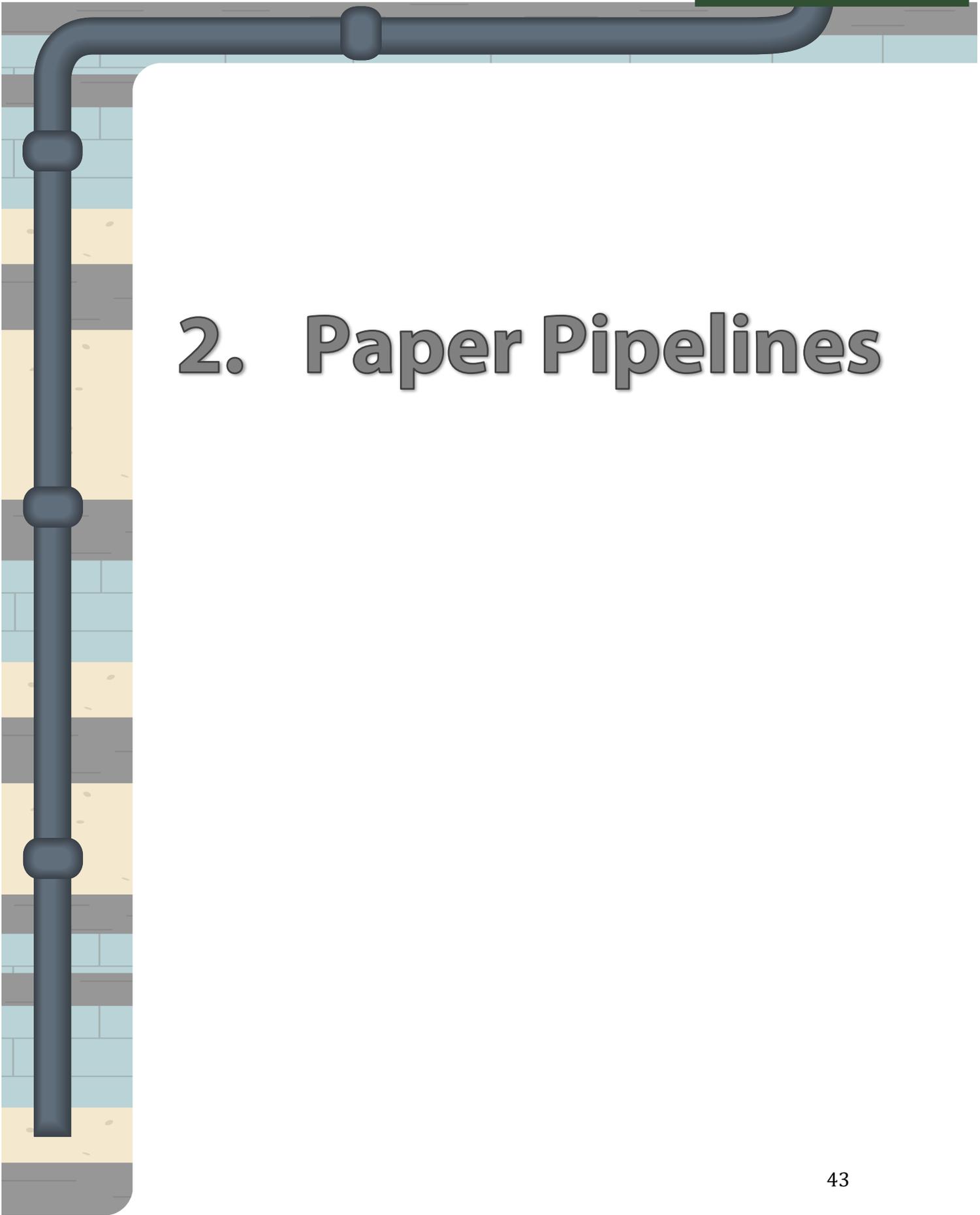
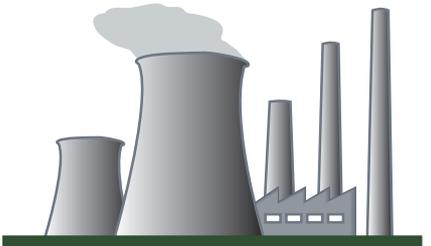


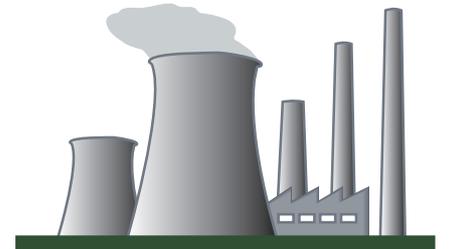
# Chapter 2



## 2. Paper Pipelines

# Paper Pipelines

## Teacher Notes



Activity Description	This is a whole class activity involving teamwork, communication and group discussions. The aim is to highlight the importance of pipeline engineering and management within the context of carbon capture and storage.
Time	1 hour
Learning Outcomes	<ul style="list-style-type: none"><li>• To consider the advantages and disadvantages of carbon capture and storage</li><li>• To evaluate the risk/reward ratio of carbon capture and storage</li><li>• To create a mind map</li></ul>
Student Organisation	Whole Class
Materials Needed	Paper Pipelines Student Worksheet, ball, cups/buckets, a variety of papers and cards, a large open space



### Talking Point

Discuss the advantages and disadvantages of pipeline transport.

Where is the CO<sub>2</sub> being transported from/to?

What is the most important thing to beware of when you design a pipeline? *Cost, security, impact on landscape, noise, materials?*

### You will need:

- One sheet of A4 paper or card for each student (plus spares)  
*Use different types and thicknesses of paper/card/plastic to vary the level of difficulty*
- A marble, table tennis ball, or golf ball
- A cup, mug or bucket
- A large classroom with space for the students to stand and move

### Task

Explain to the students that they are going to make their own pipeline. Give them a choice of materials with which to construct their pipe. Show them where to start and finish their pipeline, i.e. back corner of the room to the front corner, and place the bucket/box/cup in the finishing zone. Remind them that they are to work together.



### Extension Task

Encourage the students to experiment with angles, height differences and a variety of materials to see what effect these have on the speed and stability of the transport of the ball.



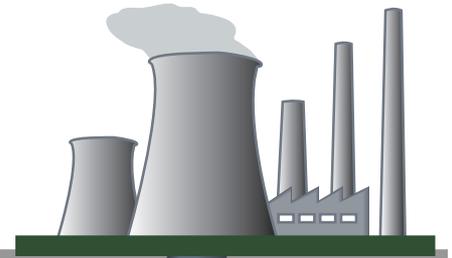
### Talking Point

What if the pipeline had to transport liquids, gases or dangerous or hazardous materials instead of just one ball? What might need to be considered?

What happens when pipelines have to travel uphill?

# Paper Pipelines

## Student Worksheet



! Pipelines can be used to transport pressurised fluids (liquids or gases) from where they are produced to where they are needed. Water, oil, natural gas, and waste gas such as CO<sub>2</sub> can be transported by pipeline.

CCS uses pipelines to transport CO<sub>2</sub> from emissions source to suitable reservoirs for storage, reducing the need to use rail or roads. Engineering these pipelines is key to the successful transport of CO<sub>2</sub>.

This activity involves working as a team to create a pipeline that can transport a table tennis ball around the classroom.

### You will need:

- One sheet of A4 paper each
- A marble, table tennis ball, or golf ball
- A cup or mug

### Instructions:

1. Place the cup at the front of the classroom – this is the target destination for the ball.
2. Think of different ways you can use your sheet of paper to create a pipeline for the ball e.g. a rolled tube, a curved sheet, a flat angled sheet.
3. Using every piece of pipe, create a continuous pipeline to transport the ball from the furthest corner of the classroom to the cup at the front.
4. Experiment with angles, styles of pipe and positioning, aiming to lengthen *and* strengthen your pipeline.

### What have you learned?

- Pipelines are only as successful as their component parts.
- There is no room for error in pipeline construction.
- Pipeline construction requires teamwork and communication.

### Extension:

- Could you create a pipeline that would enable something to travel uphill?
- What would you have to be sure of if you were transporting a gas or liquid, not a solid ball?

*Activity adapted from Wonderville.ca*