

Activity Guidance

Who Can Save STEMVILLE?

Introduction

This activity enables Environment Agency STEM Ambassadors to introduce their work to pupils and link it to elements of the National Curriculum. The main part of the activity is a budgeting challenge for pupils to devise a plan to save the fictitious town of Stemville from flooding by evaluating different flood management systems.

The aim of the activity is to highlight the various ways the Environment Agency solve flooding problems and the issues they must consider when installing flood management systems.

It is designed to be delivered either by a teacher alone or an Environment Agency STEM ambassador (if one is available) together with a teacher.



Topic | Flood management



User Environment Agency STEM Ambassadors



Age group Ages 14 - 16



Length of activity up to 2 hours



Subjects Biology, Chemistry, Geography

At the end of this activity pupils should be able to do the following:

- Describe flooding
- Explain the causes of river flooding
- Explain the link between climate change and flooding
- Describe the role of the Environment Agency
- Design a flood management system for a fictional town within a given budget
- Explain what is meant by the term carbon footprint (*optional*)

> What is the activity about and how to organise it?

This is meant as a guide to running the activity, but please feel free to adapt it to suit your particular requirements.

There are 2 versions of this activity. The full version asks students to evaluate 11 different flood management systems including the carbon footprint of each of them. The shorter version of the activity includes 8 flood management systems and the carbon footprint is not considered. Decide which version of the activity to use based upon the age and ability of the pupils, and the time available. Discuss this with the teacher in advance.

The powerpoint presentation shows the full structure of the activity and there are guidance notes for some slides.

Also discuss how much you would like to be involved in the delivery of this activity. It may be that you would prefer the teacher to deliver the session and you support the groups as they come up with their plan to save Stemville and/or help to judge the presentations. Or, you may feel more confident and want to deliver some or all of the session with the teacher's help. In either case remember to introduce yourself to the pupils by inserting a slide with your name and job role on. If you can, add a picture of yourself at work which would help pupils understand what you do (a template - slide 3 is provided in the pack).

Part 1

 **Approx 15 mins**

The pupils will be learning about floods, what causes them and how they link to climate change.

Initially find out how much pupils know about floods, why they happen and why they are a problem.

Slides 1 to 7 give prompts to activities to do this.

Slide 8 covers the following content:

- What is the link between climate change and flooding?
- How can the Environment Agency reduce the effects of flooding?

This information is part of a recorded video which is inserted into the activity slides and is vital for the pupils to understand the role that the Environment Agency plays in mitigating against the effects of flooding.

Part 2

 **Approx 60 mins**

Split the class into suitable groups of 3 to 5 students.

This part of the activity challenges the pupils to develop a flood management system for the fictional town of Stemville. Pupils are given the background history and a plan of the town and surrounding countryside which includes distances. They are provided with a list of flood management system information cards and need to work as a team of specialists to evaluate the systems and come up with a plan for protecting the town. There is a student flood evaluation sheet for each version of the activity which helps students collate the information on the flood management systems and evaluate them. In addition there is a budgeting sheet where they can summarise their choices of flood management system and its cost. More able pupils will consider the length of some of the defences. Pupils must ensure that they do not spend over the budget and then prepare a short 3 minute pitch explaining which flood management systems they have chosen and why.

As pupils work on their plans you can circulate amongst the groups. However, do not tell the pupils which defences to choose, it is up to them to evaluate them and decide what they think is the best.

Depending upon the length of school lessons the teacher may break this activity into 2 lessons and invite you to the second session to help students finish their pitches and then judge them. Alternatively the whole activity could be completed as part of an off timetable science/climate challenge activity day.

Part 3

 **Approx 45 mins**

Pupils pitch their flood management system to a representative(s) from the local council (the teacher and/or yourself). Pupils could also judge the pitches to encourage their full engagement. The winning group will be the group who comes up with the most comprehensive plan and is within budget.

Short version

The activity can be run using flood management system information cards 1 to 8 as a minimum so less reading and comprehension is required. There is a short version evaluation sheet for students to organise relevant information to help them evaluate the various flood management systems.

Extension

There is an option to extend this activity in terms of a challenge for more able pupils by including the evaluation of the carbon footprint of the various flood management systems. More detail can be found on presentation slide 15.

> Literacy Guidance for Environment Agency STEM Ambassadors

In order for pupils to comprehend a text, or the words said to them, they must understand 95% of the vocabulary used. Teachers use a concept called 'Tiers of Vocabulary' to help them to identify words that pupils will struggle with.

In summary, vocabulary can be divided into 3 tiers:

- Tier 1 - high frequency words spoken commonly (eg. table, slowly, write, horrible)
- Tier 2 - high frequency words used across different subjects, but they are not spoken as frequently so can cause significant problems for pupils when used in conversation. (e.g. formulate, evaluate, maintain, required, economic, issues, sustainable, objective)
- Tier 3 - words that are not used frequently and are subject specific (eg. osmosis, respiration, diffusion)

In education teachers take time to explain the tier 3 words. However, the tier 2 words are often neglected so these tend to be the words that pupils will struggle the most with. As a rule of thumb pupils are unlikely to understand words that are not used in everyday language.

What to avoid

- Avoid using the following words, especially without explanation. These will not be words that the pupils have studied yet and therefore will not understand unless the context is explained in very simple terms.
Mitigation, surge, deluge, effluent, measures (in the context of flooding), risk management, sustainability

There is a full list of Tier 2 words on this website if you would like more information (<https://learningspy.co.uk/literacy/closing-language-gap-building-vocabulary/>)

> Key words

Pupils' speak definitions for subject specific terminology you may use in this session:

Science

Biodegradable - A material that can be broken down by microorganisms

Carbon dioxide - A gas present in the atmosphere at a low percentage and is a greenhouse gas

Carbon footprint - The total amount of carbon dioxide and other greenhouse gases emitted by a person or over the full life cycle of a product, service, event or a person.

Global warming - the increase in the Earth's temperature due to increases in carbon dioxide and other greenhouse gas levels

Greenhouse gas – gases which trap heat in the Earth's atmosphere such as carbon dioxide and methane

Sustainable resource - A resource that will not run out because it is being managed responsibly to meet the needs of both present and future generations.

Geography

Biodiversity - Short for biological diversity, the variety of habitats and species on Earth or in a particular ecosystem.

Climate Change - The long-term change in weather patterns which leads to more extreme weather, rising sea levels and continued increases in temperature that affect people, wildlife and the environment.

Climate emergency - A scenario in which people, wildlife and the environment cannot adapt as fast as the climate is changing.

Embankments - A raised structure, usually made of earth, near a river or seafront to reduce the flood risk.





Erosion - Wearing away and removal of material by a moving force such as a breaking wave

Flood – an overflow of water from rivers, the sea or heavy rainfall

Floodplain - Relatively flat area forming the valley floor either side of a river channel that is sometimes flooded

Meander - A wide bend in a river

> Equipment needed for session

-  The activity slides provided for the session
-  Speaker equipment and projector to play the video clips and show slides
-  Pitch grading sheet for the teacher/STEM Ambassador and pupils if they are judging as well
-  Participant, winner and/or class certificates. Remember to add in the name of the teacher and/or STEM Ambassador who ran the session

Each group will need

- Flood management system information cards available either digitally or printed off and cut up - full set of 11 cards or short version (cards 1 to 8 only)
- Flood management system budgeting sheet
- Plan of Stemville printed off A3 size for annotation
- Flood management system evaluation sheet - full or short version
- Calculator

> Where does this fit into the National Curriculum?

Science Key Stage 3: Chemistry

- the production of carbon dioxide by human activity and the impact on climate.

Geography Key Stage 3

- understand how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems

Science Key Stage 4: Biology

- positive and negative human interactions with ecosystems.

Science Key Stage 4: Chemistry

- evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change
- potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's climate

Geography Key Stage 4

- Changing weather and climate – The causes, consequences of and responses to extreme weather conditions and natural weather hazards, recognising their changing distribution in time and space and drawing on an understanding of the global circulation of the atmosphere. The spatial and temporal characteristics, of climatic change and evidence for different causes, including human activity, from the beginning of the Quaternary period (2.6 million years ago) to the present day.

> Further resources

The Environment Agency - Living better with a changing climate

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1025955/environment-agency-climate-change-adaptation-report.pdf

The Environment Agency - Personal flood plan

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/444659/LIT_4112.pdf

The Environment Agency - Flood Warnings Information Service

<https://flood-warning-information.service.gov.uk/warnings>

The Environment Agency - Long Term Flood Risk Service

<https://flood-warning-information.service.gov.uk/long-term-flood-risk/postcode>

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References

Strategies for flood mitigation taken from:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/920944/023_15482_Environment_agency_digitalAW_Strategy.pdf

Strategies for flood resilience measures taken from:

https://consult.environment-agency.gov.uk/yorkshire/yorkfas/user_uploads/resistance---resilience-large-text-1.png

BBC article - What's the best way to prevent flooding?

<https://www.bbc.co.uk/news/uk-25929644>