

Grangemouth Flood Protection Scheme Primary STEM Resource Overview



This resource was created by the **Falkirk Council** as part of the **Grangemouth Flood Protection Scheme** Community Engagement.

It is designed for learners **ages 10-12** and can be delivered in a school, community group or other setting and aims to teach young people about **flood protection strategies** and identify some of the STEM roles on a large-scale flood protection scheme.

Delivery is flexible and all resources are provided are a **guideline only**. Resources can be **edited/adapted** to suit the needs of learners, teachers, available resources and timeline.

The resource explores how flooding happens and can be **delivered alongside the Falkirk Community Trust STEM Heritage boxes**, available in all schools in Falkirk and [online](#).

Learners are tasked with:

- **Researching and investigating** flood protection strategies, using some, or all, of the included resources (videos by a professional flood engineer, research worksheets and research/assessment PowerPoint)
- **Working in groups**, with each young person fulfilling an assigned role, to select one flood protection solution, decide where this solution would go on the Learner Map and how the solution would be integrated with the local landscape and community.
- **Submitting a video** explaining how their group assigned and fulfilled their roles, what their proposed solution is and why, and where they would locate their solution on the Learner Map. The video will also include 3 minutes in which the group answers questions from their teacher/facilitator, selected from a list provided.

Groups can communicate their final design in whichever way they choose. Previous methods have included a **model, drawing, PowerPoint or other, alongside the filmed presentation**.

The class of the winning group will receive a **£100 Amazon voucher**, with the classes of two further highly commended groups receiving a **£50 Amazon Voucher** each. A £50 Amazon Voucher is also available for the winning Community Group.

Grangemouth Flood Protection

Lesson Plans and Learning Outline

Key Questions



Why do we need flood protection interventions?



What jobs/roles are involved in a project of this kind?



What solutions are available and what are the costs and benefits of each?



What solution do we propose and why?

Lesson 1

Duration: 1 Hour

Key Questions:

Why do we need flood protection interventions?

What jobs/roles are involved in a project of this kind?

Description:

As an optional introduction, using the Flood Risk in Falkirk STEM Box resources, learners can explore what flooding is and why it occurs in Falkirk, Falkirk floods past and present and why people settle near the water.

The powerpoint then includes a description of some of the job roles on a flood protection project, including descriptions of the type of tasks undertaken by the professionals. Groups will need to consider what skills may be appropriate for these roles and who, among the team, best fits each role.

The activities detailed in the powerpoint are optional and teachers can choose to divide the groups and allocate roles in whichever way best suits their learners.

Lesson 2

Duration: 2/3 hours+

Key Questions:

What solutions are available and what are the costs and benefits of each?

Description:

Both this lesson, and Lesson 3, can be expanded and run over multiple sessions if the young people require more time to research and complete their proposal.

Both lessons can be flexible and dependent on the resources available in school, the amount of space permitted in the class timetable and the needs of the learners themselves and the teacher, as facilitator, is best placed to decide how they should be run. The lesson plans themselves should therefore be considered general guides to the learning rather than step by step guides to the management of the lessons themselves.

In this lesson the learners are given specific resources as a basis from which to begin their research.

Lesson 3

Duration: 2/3 hours+

Key Questions:

What solutions are available and what are the costs and benefits of each? (Continued)

What solution do we propose and why?

Description:

Both this lesson, and Lesson 2, can be expanded and run over multiple sessions if the learners require more time to research and complete their proposal. Both lessons can be flexible and dependent on the resources available in school, the amount of space permitted in the class timetable and the needs of the learners themselves and the teacher, as facilitator, is best placed to decide how they should be run. The lesson plans themselves should therefore be considered general guides to the learning rather than step by step guides to the management of the lessons themselves.

This lesson includes a more learner-centered approach to the research and specific guidance as to how the groups can begin to formulate and plan the presentation of their findings and proposed solutions.



Lesson 4 Judging

Duration: 1.5 Hours

Key Questions:

What solution do we propose and why? How can we best showcase our work to the judges?

The final lesson in the series is an opportunity for the young people to record a video and digitally present their flood protection solutions to industry experts.

Prizes will be awarded to the winners and two runners up.





Learning Intentions

- We are learning about some of reasons flooding happens.
- We are looking at some of the consequences of flooding.
- We are learning about some of the roles involved in a large-scale infrastructure project.
- We are thinking about how our own skills and interests might influence our choice of job.



Success Criteria

- I can describe some of the reasons floods occur, both on a local and global scale.
- I can explain some of the consequences of flooding and give some examples.
- I can identify the roles involved in a flooding project and explain some aspects of their job.
- I can select an appropriate role for myself and explain why I think I would be a good candidate for this role.
- I can consider the skills of others and work with my group to assign project roles.

Resource Checklist

| Number | Resource |
|---------------|-----------------------------------------------------------------------------|
| 1 | Appendix A – PowerPoint (Slides 1-12) |
| 1 per pupil | Appendix B, C and D – Learner worksheets (ability levels) |
| 1 per group | Appendix E - Skills Wheel per group (printed in A3 size) |
| 1 set of each | Post-its - 1 pack of blue and 1 pack of red plus additional packs for later |
| 1 per group | Appendix F – Group Worksheet – A3 |

| Task | Timing | Additional Challenge (AC)/Additional Support (AS) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Go over the Learning Intentions and Success Criteria.</p> <p>Discuss with the class:</p> <ul style="list-style-type: none"> - What is flooding? - Famous floods? - Is flooding always good/bad? <p>As an optional introduction to the topic you can run the activity from the Falkirk STEM box.</p> <p>Divide the young people into groups of 6. These will be their working groups for their research activity going forward.</p> <p>Do team counting activity, detailed in ppt notes (Slide 7).</p> <p>Hand each group an A3 copy of Appendix F – Group Worksheet and come up with a name (Details also noted on Slide 7).</p> <p>Hand out Appendix E - Skills Wheel (details of activity in notes on Slide 8).</p> <p>Explore the Job Roles on Appendix E (Slide 9).</p> <p>Use Appendix F – Group Worksheet to assign Job Roles (Details on Slide 9).</p> <p>Review LIs and SCs (Slides 10 and 11).</p> <p>Plenary (See Slide 12).</p> | 1 Hour 45 Mins- 2 Hours | <p>AS: <i>Talking Partners, differentiated worksheets, teacher support.</i></p> <p>AC: <i>Provide definitions for unfamiliar words using either a dictionary or an online search, differentiated worksheets, additional research tasks.</i></p> |

Teacher Project Guide

Part 1: Introduction

Protecting the heart of our communities

| | |
|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>Learning Intentions</p> | <ul style="list-style-type: none"> - We are learning to identify some of the strategies used in flood protection. - We are conducting research into the pros and cons of each of these strategies. - We are fulfilling assigned roles as part of our team. |
|  <p>Success Criteria</p> | <ul style="list-style-type: none"> - I can identify 3 specific strategies involved in flood protection. - I can use the internet and other sources to research flood protection strategies and am able to explain some of the pros and cons of these strategies. - I can explain what my role within the team is and can describe the ways in which I am fulfilling this role as part of my team. |

Resource Checklist



| Number | Resource |
|--------------------------|------------------------------------------------------------------------------------------------------|
| 1 | Appendix A – PowerPoint (Slides 13 – 21) |
| 1 per learner | Appendix B, C and D – Learner worksheets (ability levels) (already completed in the previous lesson) |
| Several sheets per group | Paper (varying sizes) and pens |
| At least 1 per group | Computers for research |
| 1 per group | Appendix G – Dice Net |

| Task | Timing | Additional Challenge (AC)/Additional Support (AS) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Review the previous lesson with the class. (See Slides 10 and 11 for previous LIs and SCs).</p> <p>Discuss new LIs and SCs (Slides 14 and 15).</p> <p>Set and Review SMART Goals for this session (Slide 16).</p> <p>Set objectives and targets for this session (use Slides 17 and 18 if required).</p> <p>OPTIONAL: Allow the teams to briefly feed back to the whole class about their intentions/goals for the session before beginning. Ask them how they will know they have achieved their intentions.</p> <p>Groups conduct their research. You can be on hand to support with any technical difficulties they may have during this process.</p> <p>Review their learning against targets set and decide next steps. (See Slide 18).</p> <p>Plenary – Question Dice (See Slide 19).</p> <p>Review LIs and SCs (Slides 20 and 21).</p> | <p>50 minutes - 1 hour per session</p> | <p>AS: <i>Talking Partners, differentiated worksheets, teacher support, professional videos.</i></p> <p>AC: <i>Differentiated worksheets, additional research tasks.</i></p> |

Teacher Project Guide

Part 2: Research and Development

Protecting the heart of our communities

| | |
|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>Learning Intentions</p> | <ul style="list-style-type: none"> - We are learning to consolidate our ideas and select one flood prevention strategy, including where on the map this should be used, based on the research we have completed. - We are learning to answer questions or concerns about our choice and explain our thinking. - We are learning how to adapt our solution to suit the needs of the community. |
|  <p>Success Criteria</p> | <ul style="list-style-type: none"> - We can bring together our research and use it to help use select and apply one flood protection strategy. - We can answer questions about our choice and explain why we made the decisions we made. - We can adjust our solution to accommodate what the judges are looking for. |

| Resource Checklist | |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Number | Resource |
| 1 | Appendix A – PowerPoint (Slides 22-33) |
| 1 per learner | Appendix B, C and D – Learner worksheets (ability levels) (already completed in the previous lesson) |
| Several sheets per group | Paper (varying sizes) and pens |
| At least 1 per group | Computers for research Appendix H - Judging Criteria Resources for making models of and/or illustrating the group's design. |

| Task | Timing | Additional Challenge (AC)/Additional Support (AS) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Discuss the LIs and SCs (Slides 2 and 24).</p> <p>Discuss the learning and results of the previous lesson with the class and go over the questions on Slide 25.</p> <p>Discuss Appendix H – Judges Criteria (Slide 26).</p> <p>Learners then have time to develop their solution as a group.</p> <p>They need to:</p> <ul style="list-style-type: none"> - select ONE of the flood protection strategies. - show where on the map they would use it. - explain how they would adjust their design to make it effective and meet the needs of the local community. <p>They should review the judging criteria regularly to ensure they stay on-track.</p> <p>They can take as many sessions as they need to complete the task.</p> <p>Groups are 'finished' when they can confidently showcase and explain their design, answering questions from the judges.</p> <p>Groups then need to film their submissions for the judges, ensuring they can clearly explain and fulfil the judging criteria.</p> | <p>1 Hour 45 Mins- 2 Hours per session</p> | <p>AS: <i>Talking Partners, differentiated worksheets, teacher support.</i></p> <p>AC: <i>Provide definitions for unfamiliar words using either a dictionary or an online search, differentiated worksheets, more complex design requirements.</i></p> |

Teacher Project Guide

Part 3: Design and Presentation

Protecting the heart of our communities

Teacher Additional Resource Pack

| Why | What | How |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Researching is a skill in itself and some children may not have been taught this skill before or put it into practice to the extent that this activity requires.</p> | <p>http://www.kathleenamorris.com/2019/02/26/research-lessons/</p> | <p>These activities can be used:</p> <ul style="list-style-type: none"> - As one stand-alone lesson. - As an introduction to each research session Alternatively they could form the basis of the ICT lessons for a term. |
| <p>Some groups may struggle to set attainable goals during their research and may struggle to stay focused as a result.</p> | <p>The SMART principle of goal setting - Goal setting - WJEC - GCSE Physical Education Revision - WJEC - BBC Bitesize</p> | <p>These activities can be used:</p> <ul style="list-style-type: none"> - To support specific groups/learners who are struggling. - To being one of the research sessions to ensure all groups stay focused. - As a lesson in themselves relating to another area of their learning or for another subject; the lessons from which can then be drawn upon during the research activity. |
| <p>Some learners may struggle to articulate their thinking so. careful questioning can help them to clarify and form their thoughts.</p> | <p>http://keithschroeder.pbworks.com/w/page/108755002/Bloom%27s%20for%20Thinking%20and%20Learning</p> <p>http://wglink.pbworks.com/w/page/38080839/Bloom%27s%20Triangles</p> | <p>These resources can be used:</p> <ul style="list-style-type: none"> - By the teacher or peers to help the learners to expand in their thinking. - By the learners to plan their research. - By the teacher to ensure the group/learners fully understand the content. |



| | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Some learners/groups might require some help with knowing where to begin sourcing information. These are a good place to start researching.</p> | <p>https://www.bbc.co.uk/bitesize/guides/zg4tfrd/revision/3</p> <p>https://www.bbc.co.uk/bitesize/guides/ztb78mn/revision/4</p> <p>https://www.bbc.co.uk/bitesize/guides/zy99nbk/revision/3</p> <p>https://www.bbc.co.uk/bitesize/guides/zwjv82p/revision/4</p> | <p>These resources could be used:</p> <ul style="list-style-type: none"> - By the teacher; either working one to one with groups or by providing links on the smartboard - By the groups; potentially as part of a pack of helpful resources given to groups to direct them |
| <p>Videos to exemplify the problems caused when flooding becomes an issue.</p> | <p>https://www.youtube.com/watch?v=jk75aOP-rGA (Flooding in York in 2012 (with at the end an example of a flood gate)</p> <p>https://www.youtube.com/watch?v=v4gPfy1jbyk</p> <p>https://www.youtube.com/watch?v=Z3wt_wgJOk</p> | <p>These resources could be used:</p> <ul style="list-style-type: none"> - By the teacher to illustrate the issues floods can cause and why suitable flood defences are required. |
| <p>Additional Research Websites.</p> | <p>http://www.coolgeography.co.uk/gcsen/PL_Flood_Management.php</p> <p>https://www.bbc.co.uk/bitesize/guides/zx9kfrd/revision/3</p> <p>https://www.bbc.co.uk/bitesize/guides/zx9kfrd/revision/4</p> <p>https://www.youtube.com/watch?v=mTdjZG-eiak</p> <p>https://www.youtube.com/watch?v=fjapgTd-Qug</p> | <p>These Resources could be used:</p> <ul style="list-style-type: none"> - By teachers to direct learners in their research strategically - By learners in the form of a paper or digital handout |



Grangemouth Flood Protection Scheme

Prezi Video Guide

Presented by Adele Jaccon, a Jacobs Engineer working on the Grangemouth Flood Protection Scheme, the videos below provide additional information to learners about the different methods of flood protection available, where and when you would use them and some additional information to get young people started. They can be used in addition to, or instead of, the Learner Worksheets and/or Learner Research or Assessment PowerPoint.

| Video | Length | Link |
|-----------------------|----------|---------------------------------------------------------------------------|
| Introduction | 42s | Introduction by Adele Jaccon on Prezi Video |
| Flood Walls | 2min 52s | Flood Walls by Adele Jaccon on Prezi Video |
| Embankments | 2min 4s | Flood Embankments / Levees by Adele Jaccon on Prezi Video |
| Flood Gates | 2min 19s | Flood Gates by Adele Jaccon on Prezi Video |
| Flood Storage Areas | 2min 7s | FSAs by Adele Jaccon on Prezi Video |
| Flood Relief Channels | 1min 52s | FRCs by Adele Jaccon on Prezi Video |
| Culverts | 1min 55s | Culverts by Adele Jaccon on Prezi Video |
| Top Tips | 1min 32s | Top Tips by Adele Jaccon on Prezi Video |



Falkirk Council

Protecting the heart of our communities



GRANGEMOUTH
Flood Protection Scheme
Protecting the heart of our communities

Grangemouth Flood Protection

FAQs

1. Do I have to select just one Flood Protection Strategy/ Option to use in my design?

Yes. When designing a real-life flood protection scheme engineers would consider a range of options and use a selection of them to create a full area scheme, rather than one single flood defence strategy. However, whilst we want young people to be aware of the options available to them and the fact that professionals would use several of these options, we want to young people to focus on one specific solution and explain:

- **Where they would use it (on the map).**
- **Why they chose it.**
- **Any additional or alterations they would make** (for example, would they use specific materials to make it more environmentally sustainable etc).

We want to see that the young people can justify their decisions around which option they've used and where it would be placed on a map.

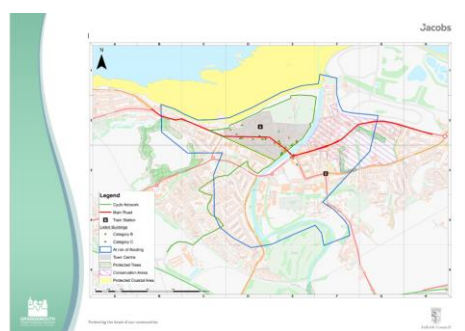
Groups can showcase their scheme in a variety of ways:

- **By illustrating the learner map below.**
- **Creating a 3D model of the area and their finished designs.**
- **Creating a PowerPoints showcasing the design, it's location and the group's thinking.**

Or any other media that they choose! What is important is that the judges can clearly see what the design contains and that the young people can explain their decisions. Finished solutions are submitted via pre-recorded video through WeTransfer or similar.

2. Which area is my flood protection scheme design covering?

The design covers a **fictional area**, shown on the map included in the resource pack. We want the young people to design their scheme for **this area, not Grangemouth or Falkirk.**



Falkirk Council



3. How can I best support all my learners?

The lesson plan outlines some ideas on how to support the learners in your class but, as their teacher or group facilitator, you are the expert in your young people.

We recommend using strategies such as mixed ability groups, pairing up young people to complete challenging tasks and using the differentiated worksheets provided to support learners in whichever way best suits their needs.

You can also limit the options available to young people to choose from; for example, you may only wish them to consider 3 of the possible options for flood protection and provide the research information for them through the Learner Research or Assessment PowerPoint and Learner Answer Sheet rather than tasking young people with researching options themselves.

4. Are there opportunities for additional curricular links within the topic?

Absolutely! We've heard from teachers using the resource as a subject for learning through class debates, research papers and there are opportunities for art activities, learning around local history, science experiments exploring water and flooding as well as many more. The broader the context for learning the more robust the young peoples' understanding will be and the more the topic will reflect real-life infrastructure projects.

5. Do I need to cover every single aspect of each lesson?

No, each educator delivering this programme is coming from a different context, as are the learners. We want the resource to be adaptable enough to suit each and every context in which they are being delivered. Feel free to tailor the Educator's Project Guide and any other resource to suit your needs.

Please note; whilst this guide is kept deliberately succinct, further detail on how to deliver the activities (should you require it) can be found in the 'notes' under slides in the PowerPoint.

6. What Experiences and Outcomes does this project cover?

The specific Es and Os will vary depending on how you deliver the project, however we anticipate you will likely cover the below:

When I engage with others, I can respond in ways appropriate to my role, show that I value others' contributions and use these to build on thinking. **LIT 2-02a**

As I listen or watch, I can identify and discuss the purpose, main ideas and supporting detail contained within the text, and use this information for different purposes. **LIT 2-04a**

As I listen or watch, I can make notes, organise these under suitable headings and use these to understand ideas and information and create new texts, using my own words as appropriate. **LIT 2-05a**

When listening and talking with others for different purposes, I can:

- share information, experiences and opinions.
- explain processes and ideas.
- identify issues raised and summarise main points or findings.
- clarify points by asking questions or by asking others to say more. **LIT 2-09a**



Falkirk Council

I am developing confidence when engaging with others within and beyond my place of learning. I can communicate in a clear, expressive way and I am learning to select and organise resources independently. **LIT 2-10a / LIT 3-10a**

I can make notes, organise them under suitable headings and use them to understand information, develop my thinking, explore problems and create new texts, using my own words as appropriate. **LIT 2-15a**

I can use my notes and other types of writing to help me understand information and ideas, explore problems, make decisions, generate and develop ideas or create new text. I recognise the need to acknowledge my sources and can do this appropriately. **LIT 2-25a**

By considering the type of text I am creating, I can select ideas and relevant information, organise these in an appropriate way for my purpose and use suitable vocabulary for my audience. **LIT 2-26a**

I can convey information, describe events, explain processes or combine ideas in different ways. **LIT 2-28a**

I can persuade, argue, explore issues or express an opinion using relevant supporting detail and/or evidence. **LIT 2-29a**

I can describe the physical processes of a natural disaster and discuss its impact on people and the landscape. **SOC 2-07b**

I can consider the advantages and disadvantages of a proposed land use development and discuss the impact this may have on the community. **SOC 2-08b**

By experiencing the setting up and running of a business, I can collaborate in making choices relating to the different roles and responsibilities and have evaluated its success. **SOC 2-22a**

When exploring technologies in the world around me, I can use what I learn to help to design or improve my ideas or products. **TCH 2-01a**

Throughout all my learning, I can use search facilities of electronic sources to access and retrieve information, recognising the importance this has in my place of learning, at home and in the workplace. **TCH 2-03b**

Opportunities to carry out different activities and roles in a variety of settings have enabled me to identify my achievements, skills and areas for development. This will help me to prepare for the next stage in my life and learning. **HWB 2-19a**

I am investigating different careers/occupations, ways of working, and learning and training paths. I am gaining experience that helps me recognise the relevance of my learning, skills and interests to my future life. **HWB 2-20a**

I have the opportunity to choose and explore an extended range of media and technologies to create images and objects, comparing and combining them for specific tasks. **EXA 2-02a**

I can develop and communicate my ideas, demonstrating imagination and presenting at least one possible solution to a design problem. **EXA 2-06a**

7. Where can I find information on the real-life Grangemouth Flood Protection Scheme?

You can find out more about what's happening on the project through the Grangemouth Flood Protection Scheme Website [here](#).

If you have any additional questions please do reach out to a member of the team for further information and we will be happy to help.



Falkirk Council