



This document is one of a suite of Factsheets that are part of the support offered to schools and teachers. The Factsheets provide guidance, ideas and link to resources to support your Citizen Science activities. They also contain suggestions for extended learning relating to problem solving, numeracy, geography and social studies. We hope they will provide all the guidance you need to develop lessons to fit with your own curriculum plans. For general enquiries contact – Amanda Malcolm, Citizen Science Coordinator, citizenscience-scotland@tcv.org.uk, 0141 552 5294.

Flooding Factsheet

Introduction

The destructive powers of flooding events have been noted for centuries but flooding events in Scotland are of more and more concern. This factsheet gives an outline of flooding issues in Scotland and provides information about how flood risk can be managed to reduce the impact on communities.

By the conclusion of the Citizen Science Project it is anticipated that learners will be able to:

- State whether or not their homes and communities are at risk of flooding
- Explain what flooding is and list some of the causes of flooding
- Describe the water cycle and give a description of different types of flooding
- Describe the impacts of flooding and explain what can be done by individuals, communities, national organisations such as SEPA and the Government to minimise flooding
- State that the Flood Risk Management (Scotland) Act 2009 has been introduced to manage flooding and to help protect communities from flooding

Activity suggestions – You can find out if your area could be affected by flooding from either a river or the sea by looking at the [SEPA flood map](#). Full instructions on how to use the map can be found on the website. You can also check newspaper websites to investigate if there have been recent floods near you.

Where does flooding come from and what is it?

Water is a natural resource which is continuously renewed. In this cycle, water is in constant motion, moving from the ocean to the sky to the earth. **Flooding** is a natural event which occurs when water overflows a stream, river or drain. Floods are caused by rainfall, melting snow or ice, or by the failure of structures such as dams.

Different parts of the water cycle

- **Surface runoff:** Rain on the surface of the earth can lead to surface run-off. This then flows into a water body (e.g. a burn or loch);
- **Evaporation:** The sun warms the water surface so the water changes into vapour (evaporation). In the air this water vapour condenses to form clouds which release the moisture in the form of rain and snow (precipitation). This is how the water cycle repeats itself.
- **Infiltration:** When rain falls on soil, some of the water is absorbed by the soil.
- **Transpiration:** Some water in the soil is used by plants where it is transported to the leaves and lost to the atmosphere as vapour.
- **Percolation:** The vertical movement of water through soil.
- **Through-flow:** The lateral movement of water through soil.
- **Saturation:** Percolating water infiltrates through pore spaces in the soil, passing through the unsaturated zone finally makes its way to a saturated zone (where all spaces between rock and soil are filled with water).

Activity suggestions – You can find out what to do if your area is affected by flooding by looking at the SEPA Floodline website <http://www.floodlinescotland.org.uk/>

- **Ground water discharge:** Water fills the spaces between soil particles and rock in the saturated zone is called groundwater. The upper limit of the saturated zone is known as the water table and is lowered as ground water is discharged. Ground water can flow through rock and soil layers until discharged in a stream, lake or ocean.

Activity suggestions – Study the **hydrological or water cycle** to learn how water moves through the environment
http://www.bbc.co.uk/schools/gcsebitesize/geography/water_rivers/background_rivers_rev1.shtml

- **What types of flooding are there?**

The main types of flooding are:

- **River flooding:** when the area around a river (the catchment) gets more rain than usual, the river is not able to cope with this extra water; the water level rises and flooding occurs. This flooding may occur at

any point in the river, not necessarily at the point where the extra water has entered the river.

http://www.sepa.org.uk/water/river_levels.aspx

- **Coastal flooding:** occurs when normally dry, low land near the sea is flooded by sea water. Weather and tidal conditions can increase sea levels and increase the chance of coastal flooding.
<http://www.floodsite.net/juniorfloodsite/html/en/teacher/thingstoknow/hydrology/coastalfloods.html>
- **Surface water flooding:** this happens when there is heavy rain on the ground that is already saturated, or on paved areas where drainage is poor.
- **Groundwater flooding:** when rain causes the water that is naturally stored underground to rise to the surface. Higher levels of rainfall cause the water to rise above normal levels. In low-lying areas the water table is usually at shallower depths meaning that during wet periods the water table can rise up to the surface and cause flooding
[\(http://www.cdc.gov/healthywater/drinking/private/wells/\)](http://www.cdc.gov/healthywater/drinking/private/wells/).
- **Drain and sewer flooding:** this can occur during heavy rain when drains become blocked or full and can lead to contamination of drinking supplies. This type of flooding depends on the capacity of the sewage system
<http://www.floodsite.net/juniorfloodsite/html/en/teacher/thingstoknow/hydrology/urbanfloods.html>

Activity suggestions - Study the Scottish Governments website on the impacts flooding can have an effect on people and society, the economy, jobs and businesses, and the environment.

<http://www.scotland.gov.uk/publications/2007/04/02121350/5>

Social impacts: People can die because of flooding in Scotland or directly as a result of trying to protect their property from flooding. In some countries many people die because of flooding.

Activity suggestions – Study the **Scottish Flood Forum** <http://www.scottishfloodforum.org/> which provides information about what to do in a flood and has factsheets that can be downloaded.

Economic impacts: the economy can also be severely affected by flooding.

Environmental impacts: the environmental impacts from flooding can be both positive and negative.

What can we do about flooding?

Although flooding cannot be prevented from happening, we can take precautions to limit the impact it can have on our lives and our property. There are currently over 130,000 homes and businesses in Scotland that are at risk from flooding. There are lots of things that can be done so people and communities are not affected so much by flooding. It is argued that doing things in all parts of the river catchment is the best way to reduce the impact of flooding.

- **In the upper catchment,** in the hills, wetlands can be made and woodlands planted to store the water and slow its flow into the rivers.
- **In the middle of the catchment** rivers can be monitored to help show if the river is getting full and there is likely to be a flood. This will help in warning people who might be flooded downstream.

- **In towns and villages** lower down in the catchment buildings and communities can be built away from areas that are likely to be flooded.
- **Individual and families** can sign up to SEPA's Flood Warning Service. This service makes sure that people are warned if a flood is likely. SEPA and the Scottish Flood Forum provide information so that people know what to do to protect themselves and their houses from a flood.

Activity suggestions – Study the Flood Risk Management (Scotland) Act 2009
<http://www.legislation.gov.uk/asp/2009/6/contents>) and consider the different ways we can all help to manage flood risk. .
<http://www.sepa.org.uk/environment/water/flooding/flood-risk-management/>
[http://www.sepa.org.uk/library/content-search?q=flooding publications](http://www.sepa.org.uk/library/content-search?q=flooding%20publications)

A new approach to managing flood risk

In the past, building on flood plains and along coasts took place with less knowledge of the risks than we have available to us today. In places, this has left us with a difficult legacy to manage. Actions taken in the past have also meant that we have lost features of our natural landscape that can help store and slow flood waters, including flood plains and wetlands. A similar trend has occurred as our towns have expanded and green spaces, gardens and other natural drainage features have been lost. Traditionally we have relied on civil engineered defence solutions with walls, dams, barriers but if we are to keep pace with climate change projections these schemes will need to be larger and therefore more expensive to design and build.

The Flood Risk management (Scotland) Act 2009 ensures that different organisations involved in flooding work together to make sure flood impacts are as small as possible. It also means not relying solely on civil engineered solutions but considering how working with natural features can help store more water in soil and vegetation and slow water flow within the river itself. Warning and informing people of risks and dangers of flooding are important.

Outcome statement	Curriculum area
I can use evidence to recreate the story of a place or individual of local historical interest. SOC 1-03a	Social studies > People, past events and societies
I can consider ways of looking after my school or community and can encourage others to care for their environment. SOC 1-08a	Social studies > People, place and environment
I can discuss the environmental impact of human activity and suggest ways in which we can live in a more environmentally-responsible way. SOC 2-08a	Social studies > People, place and environment
I can develop my understanding of the interaction between humans and the environment by describing and assessing the impact of human activity on an area. SOC 4-10a	Social studies > People, place and environment
I can use specialised maps and geographical information systems to identify patterns of human activity and physical processes. SOC 4-14a	Social studies > People, place and environment
Having analysed how lifestyle can impact on the environment and Earth's resources, I can make suggestions about how to live in a more sustainable way. TCH 2-02a	Technologies > Technological developments in society
From my studies of sustainable development, I can reflect on the implications and ethical issues arising from technological developments for individuals and societies. TCH 3-02a	Technologies > Technological developments in society
I can examine a range of materials, processes or designs in my local community to consider and discuss their environmental, social and economic impact, discussing lifetime cost to the environment in Scotland or beyond. TCH 4-02a	Technologies > Technological developments in society