Adaptation Scotland
supporting climate change resilience

Diversion instructions

The climate change adaptation board game contains two diversions.

You must **stop** and follow the diversion instructions before you move on. At the diversions, teams are given a scenario and two decision pathways – one pathway is to invest in long-term adaptation actions; this is an expensive option. The other pathway is short-term and designed to deal with current challenges; this decision path is substantially cheaper. The decision pathway selected here will have financial implications as the team moves along the diversion.

Please note that the diversion scenarios are fictional. *The costs attributed to the different options are examples designed to generate discussion and to illustrate the investment decisions you may have to make as a result of extreme weather and climate change.*

The following pages contain a set of cards for each diversion. You should print the cards double-sided and climate facts will be printed on the reverse.

Cut out the cards and place them in envelopes marked Diversion 1A-G and Diversion 2A-G.

Diversion 2

You are building a new school in your community. You have been informed of the projected changes to future climate which can be summarised as:

- Hotter, drier summers
- Milder, wetter autumns and winters
- Increase in summer heat waves, extreme temperatures and drought
- Increased frequency and intensity of extreme rainfall events
- Less frost and snowfall
- Sea level rise

It has been recommended that you include a number of adaptation measures in order to increase resilience to future climate. Measures include:

- Green roofs to reduce water run-off
- Permeable play areas and driveways to drain water easily
- Natural ventilation systems
- Shutters to provide shade
- Capture and re-use grey water from showers and rainwater
- Ground source heat pumps
- Raised flooring to reduce flood risk
- Plants that are resilient to drought
- Power sockets and electrical equipment above the flood line
- Trees for shading
- Sustainable urban drainage scheme

To include all of these measures would cost an additional £20 million.

Your team now has some decisions to make:

Option 1 – You can put in place the majority of the recommended adaptation measures. If you choose this option pay your banker **£20 million** and throw the dice to move along the diversion.

Option 2 – You can put in place a small number of measures which may provide short-term protection. These will cost an additional £3 million. If you choose this option, please pay your banker **£3million** and throw the dice to move along the diversion.

Please make your decision now and pay the banker the appropriate sum of money.

Each time you land on a diversion square the banker should hand you the corresponding card to reveal your consequences (which may be positive or negative irrespective of your decision above). **Good luck!**

Diversion 2A

Following an intense period of heavy rainfall, many parts of the region are flooded.

Option 1 – Congratulations! The raised floors, permeable surfaces and SUDs you installed have reduced the consequences of flooding. Continue on your way.

Option 2 – The school has suffered significant flooding and must close for an extensive period for repairs. **Pay £10 million to your banker.**

Diversion 2B

Following a number of very mild winters, heavy snow causes chaos.

Option 1 & 2 – the capacity of transport and utilities' providers to cope with heavy snow has been reduced. People cannot get to work and incoming and outgoing deliveries are disrupted forcing businesses to incur unexpected additional cost and causing reputational damage. **Pay £3 million to your banker.**

Diversion 2C

Glasgow & Clyde Valley experiences unprecedented summer temperatures with a new record high.

Option 1 – your green roofs, natural ventilation and shading options prove invaluable during this period. **Collect £5 million from your banker.**

Option 2 – the school is unbearably hot with pupils listless and productivity down. Electric fans are required. **Go back 2 spaces**.

Diversion 2D

Energy prices are continuing to rise as a result of global market forces, placing increased strain on school budgets.

Option 1 – The school's green roofs provide insulation in the winter and have a cooling effect in the summer. This, along with the natural ventilation system, is helping to reduce energy use. **Well done, your investment has paid off. Collect £1million.**

Option 2 – Options for reducing energy consumption are limited due to the building design. The school continues to incur increased charges. **Pay £1 million to your banker.**

Diversion 2E

A rise in average summer temperatures is now noticeable.

Option 1 – The natural ventilation system is no longer working correctly as staff members that were trained to use it have now left and no further training has been scheduled. **Go back 2 spaces.**

Option 2 – The school has not been built to cope with such high average temperatures and conditions have become uncomfortable. **Pay £3 million to your banker.**

Diversion 2F

Autumns and winters have become considerably milder but wetter.

Option 1 – the permeable surfaces and green roofs effectively manage excess water and the natural ventilation system ensures a healthy building. **No action required.**

Option 2 – the building has problems with damp and fungal growth leading to concern among parents of children with respiratory illness. Upgrades must be carried out. **Pay £5 million to your banker.**

Diversion 2G

We've been fortunate – so far climate change in Scotland has been at the lower end of the range in projections.

Option 1 – Questions are being asked about the extent of climate adaptation work that was undertaken and its necessity. **Go back 1 space**.

Option 2 – the short-term measures are doing the job! **Collect £2 million from your banker.**

Diversion 2H

All is well with the world!

Move on one space ☺

FACT

In 2013 Scottish Water announced a multi-million pound programme of investment to transform the Greater Glasgow area's underground water and waste water systems. Work by the Metropolitan Glasgow Strategic Drainage Partnership has laid the foundations for Scottish Water's investment in waste water infrastructure. The Partnership has a vision to tackle flooding, improve river water quality, and create capacity for economic growth – a true vision of resilience.

FACT

In March 2013, heavy snow caused disruption across Scotland. Southern Scotland was among the worst affected areas with many animals stuck without food. The blow to agriculture and the economy was worsened by one of the worst power blackouts in Scotland for 30 years, with 400 engineers working to repair lines as over 3,000 people were cut off across Argyll and Arran. For the first time in Scottish and Southern Energy's history, two large metal pylons were toppled by snow and ice.

FACT

Evidence from the UK, mainland Europe and North America has indicated that savings in energy made from green roof installations has provided payback times in the region of three-to-five years. A green roof in Canary Wharf, London is estimated to save £5,000 per year, while German studies have shown 2 litres/year of fuel is saved for every square metre of green roof. Other benefits include more constant internal temperature, surface water run-off attenuation, habitat provision, trapping and filtering pollutants and improved health and wellbeing (Scottish Green Roof Forum).

FACT

Wholesale power prices are expected to rise by 18 per cent in the UK between 2013 and 2018 according to a study by EnergyQuote GHA. Those who have invested in on-site energy generation and adopted energy efficiency measures will be more resilient than those who still rely on grid electricity and gas.

FACT

Regional spatial planning and urban design can reduce vulnerability to heat-related impacts. Green infrastructure (including gardens, parks, productive landscapes, green corridors, green roofs and walls) and blue infrastructure (including rivers and SUDS) play a vital role in creating climate resilient development (Green and Blue Space Adaptation for Urban Areas and Eco Towns – GraBS, 2013).

FACT

Flooding has a range of health-related impacts, including:

- Stress or depression caused by damage to homes and personal belongings;
- Respiratory illness due to growth of fungus and bacteria;
- Physical injury or death caused by inability to evacuate home or workplace quickly.

Flooding can also have indirect health impacts such as compromising access of patients and medical supplies to hospitals.

FACT

All organisations have risk management and/or emergency procedures in place. Managing risk is critical to business continuity, planning and decision making. Risk assessments are helpful for considering the cost of future repairs, business downtime, insurance and control measures, as well as for considering environmental, health and safety, and reputation impacts. While extreme weather and climate change risks require long-term vision, it is important they are incorporated into routine business planning and decision making.

FACT

What *opportunities* will climate change present to you and your organisation? Discuss in groups what these are and how you can exploit them.

Diversion 2I

During a recent summer, temperatures exceeded 26^{O}C for five successive days during the summer school term.

Option 1 – The natural ventilation system, window shutters, green roofs and shaded areas provided by trees have helped to keep everyone cool and comfortable. **Congratulations, your investment has paid off.**

Option 2 – The school building is too warm to work in; south-facing classrooms with no shading are unbearably warm. The school is forced to buy in bottled water and urgently needs to introduce natural shading and air conditioning to prevent overheating in future. **Pay £3million for air conditioning and tree planning.**

Diversion 2J

Summer temperatures have become noticeably higher and there have been a number of droughts in the past few years.

Option 1 – your water efficiency measures and drought resilient plants have helped during these periods. **Move forward 1 space.**

Option 2 – managing water during this time is proving difficult and the school garden lacks life due to the hosepipe ban.
Go back 1 space.

Diversion 2K

Persistent and heavy rainfall is becoming more common particularly during autumn and winter.

Option 1 – Permeable surfaces, green spaces and SUDs systems are helping to ensure that the school grounds are normally clear of surface water allowing children to continue playing outside even during wet weather.
Move forward two spaces.

Option 2 – Surface water is lying for long periods in the school grounds due to impermeable surfaces meaning children are unable to play. Measures to introduce green spaces and trees are now being considered to help overcome this problem. **Pay £4 million to the banker.**

Diversion 2L

Very heavy rainfall has caused severe flooding for the second time in 6 months in a neighbourhood where many children and school teachers live.

Options 1 and 2 – Children and staff whose homes and belongings have been damaged by flood water are suffering from stress. School attendance has been disrupted due to the need for repair work.

Pay £1 million to cover the cost of repairs and supply teachers.

FACT

Research by JRF (2011) suggests that heat vulnerability has a very strong social dimension with the highest exposure in disadvantaged communities. The following factors influence vulnerability:

- Exposure to high temperatures at home and at work due to building design and fabric;
- Sensitivity to heat stress, influenced by respiratory, physical or mental health and age;
- Ability to pay for air-conditioning or gain access to cool outdoor space; and
- Lack of knowledge or perception of vulnerability, which may reduce chances of receiving support.

FACT

Islanders in the Hebrides were offered free devices for their toilet cisterns in a drive to save water during an unprecedented drought. Villages across South Uist, North Uist and the Isles of Harris and Lewis were affected. The situation was more acute in Stornoway where Scottish Water warned that reservoirs levels dropped below critical levels and engineers had to fix leaks to conserve every last drop of water.

FACT

The Scottish Environment Protection Agency encourages surface water runoff from all developments to be treated by sustainable drainage systems (SUDS) in line with Scottish Planning Policy. SUDS help to protect water quality and reduce flood risk, and can be appropriate in urban and rural situations. Cost-effective SUDS can be found for almost every situation, and can be a cheaper alternative to traditional drainage measures. SUDS also provide opportunities for increased amenity and biodiversity value of sites.

FACT

Scottish Government (2007) found that the trauma of being flooded and its immediate aftermath was by far the most significant intangible impact, disproportionately felt by the elderly and most vulnerable. Anxiety and stress peaked after the flood, when the scale of disruption became clearer and initial coping strategies dwindled. Physical and mental ill-health impacts also became apparent, exacerbating chronic conditions. Dealing with building contractors and monitoring the quality of repair work proved stressful.