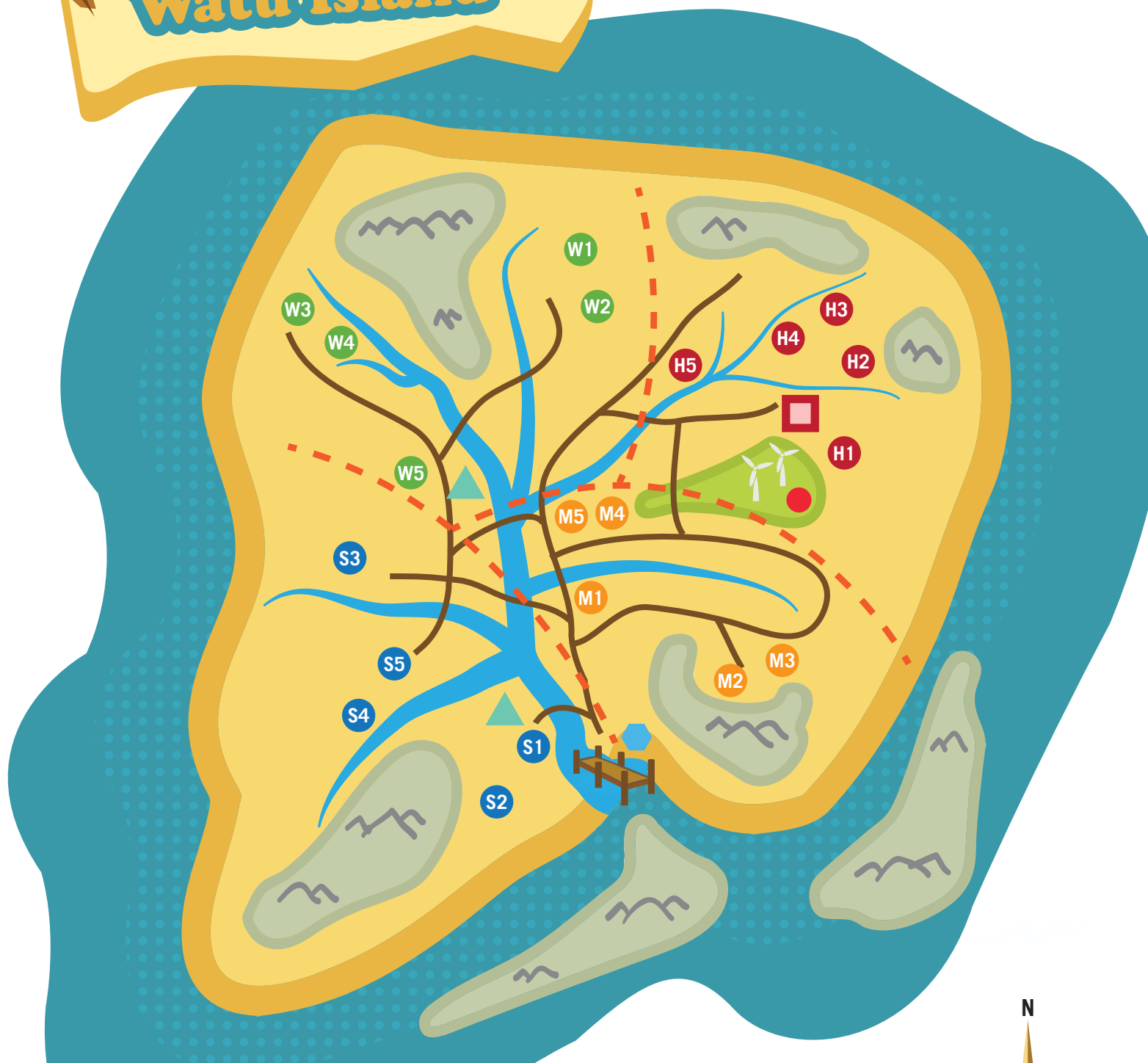
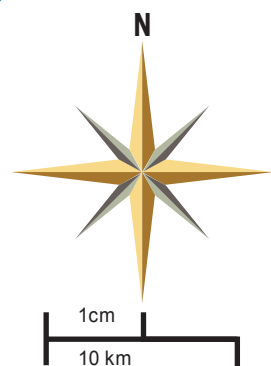


Watu Island



Key

- | | | | |
|---------------------------------------|---------------------|--------------------------------------|--------------------|
| S | Savuvi homes S1-S5 | ● | Mountain areas |
| W | Wazenzi homes W1-W5 | ● | Forest |
| H | Hila homes H1-H5 | ▲ | School |
| M | Milma homes M1-M5 | ■ | Health centre |
| --- | Community borders | ⬡ | Port |
| — | Road | ● | Wind power station |
| — | Rivers | | |



Beat the Flood

Watu Island Community Cards

Divide the class into small groups of 4-5 pupils. Give each group a map of Watu Island and one of the four community cards below. Each group will take on the role of living in that community.

After the pupils have had a chance to look at the map and read their community cards, have a class discussion about **who** and **what** is most at risk of flooding in their community.

Help pupils develop a list of flood risk factors on the island, such as closeness to river and sea, terrain, ages and abilities of people to respond to flooding.

Community name: The Savuvi

Location: live in the South West of the island

Homes: 5

Other buildings: primary school for 50 children

Average household size: 6 people

Main jobs in community: fishermen, skilled at boat building and carpentry



Community name: The Milma

Location: live in the central area of the island

Homes: 5

Other buildings: wind turbine and generator supplying electricity

Average household size: 6 people

Main jobs in community: farmers and skilled foresters



Community name: The Wazenzi

Location: live in the North West of the island

Homes: 5

Other buildings: secondary school for 30 pupils

Average household size: 8 people

Main jobs in community: builders of traditional homes and brick makers



Community name: The Hila

Location: live in North East area of the island

Homes: 5

Other buildings: health centre and hospital

Average household size: 7 people

Main jobs in community: land farmers and skilled craft people



Beat the Flood

Learning from others

For your challenge you need to carry out some research to help develop your ideas.

We suggest using the internet to find out about flood-proof homes in different countries. You might want to use search terms such as flood-resistant homes and flood-proof houses.

Keep a record of any useful information and pictures that could help develop your ideas.

An example from Practical Action

Practical Action works with people whose lives are affected by flooding.

In north western Bangladesh, many families live in fear of the rainy season which is leading to increased flooding of many of the 320 rivers that criss-cross the country.

"Ten years ago, our neighbourhood was eroded by the river Jamuna. We lost our home, land, cattle-shed and cattle to floods." Aklima Begum

Practical Action worked with the community along the Jamuna River to develop low cost flood-resistant housing.



Improved flood-resistant homes

The main features of the new homes designed and built to withstand river flooding are:

- 🔹 Houses are built on a plinth of sandy soil, brick and concrete. This makes them strong and high enough to last through repeated floods.
- 🔹 Jute panels make the walls resilient to floods, cost very little and are quick and easy to replace.
- 🔹 Treated bamboo poles on concrete bases are strengthened with metal tie rods to hold the wall firm and safe.
- 🔹 Fastenings bind the walls firmly to the houses 'skeletons' through a network of holes and notches. This means the houses can stay standing through the strongest of winds and rain.
- 🔹 Corrugated iron sheets are used on the roofs to make the houses more rain resistant.

Other features

- 🔹 Water-thirsty plants such as bamboo and banana are grown around the houses. They 'drink up' flood water and hold onto the soil, helping the ground around the homes to stay intact.

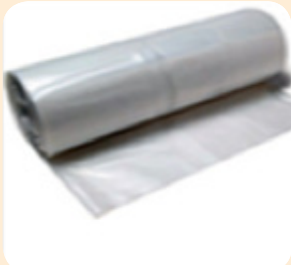
For more detailed information on flood resistant-homes in Bangladesh go to <http://practicalaction.org/flood-resistant-housing-drr>



Beat the Flood

Materials cards

Use the cards below to help you to make decisions about the choice of materials for your flood-proof home, your modelling materials and the costs involved.



Polythene Roll

For modelling you could use cling film



Properties: water resistant, does not provide structural strength, tears easily, malleable, non-recyclable, non-biodegradable

Availability: imported onto the island by boat - low transport costs due to its low weight

Material cost: £5 per roll (10m x 1m)



Concrete

For modelling you could use plasticine



Properties: water resistant, very strong, difficult to demolish, durable, malleable, non-recyclable, non-biodegradable

Availability: imported onto the island by boat - weight of material leads to high transport costs

Material cost: £10 per sack covering 15m²



Polyurethane Sheet

For modelling you could use plastic bottles or polypropylene



Properties: water resistant, strong, recyclable, difficult to cut, liable to cracking, non-biodegradable

Availability: imported onto the island by boat - low transportation costs due to weight

Cost: £40 per roll (10m x 2m)



Steel

For modelling you could use foil food trays or card wrapped in foil



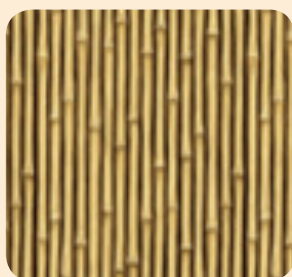
Properties: water resistant, prone to rust, strong, recyclable, difficult to cut into sections, non-biodegradable

Availability: imported onto the island by boat – weight of material leads to increased transport costs

Cost: £50 per sheet (2m x 3m)



Beat the Flood



Bamboo

For modelling you could use straws



Properties: water resistant, reasonable strength but will need binding together, biodegradable, recyclable

Availability: easily available on the island

Cost: £1 per 1m treated bamboo cane



Softwood

For modeling you could use wood splints or lolly sticks



Properties: very absorbent, reasonable strength, susceptible to termites, biodegradable, recyclable

Availability: readily available on the island in all forest areas

Cost: £2 per 1m length



Dung/Soil/Ash

For modelling you could use mud or clay



Properties: malleable, recyclable, biodegradable, repels termites, fibrous which stops soil cracking

Availability: readily available in many areas of the island

Cost: free



Glass

For modelling you could use perspex, plastic or clingfilm



Properties: recyclable, non-biodegradable, water resistant, highly fragile

Availability: imported onto the island by boat - weight of material leads to high transport costs compared to locally available material

Cost: £30 per sheet (2m x 1m)



Beat the Flood



Hardwood

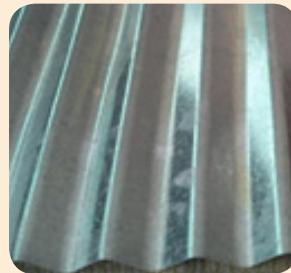
For modelling you could use lolly sticks or balsa wood



Properties: absorbent, strong, durable, resists termites, biodegradable, recyclable

Availability: this needs to be transported onto the island down the river. There is no readily available hardwood on the island

Cost: £10 per 2m plank



Corrugated iron

For modelling you could use aluminium foil or corrugated plastic



Properties: water resistant, prone to rust, strong, recyclable, difficult to cut into sections, non-biodegradable

Availability: imported onto the island by boat - weight of material leads to high transport costs compared to locally available material

Cost: £40 per sheet (2m x 1m)



Bricks

For modelling you could use plasticine or lego bricks



Properties: strong, weather resistant, durable, recyclable, non-biodegradable

Availability: can be made on the island or imported via boat

Cost: 50p per brick



Reeds

For modelling you could use grass or leaves



Properties: need attaching to another structure, malleable, weather resistant

Availability: available throughout the island

Cost: free



Beat the Flood

Summary of costs

 <p>Polythene Roll Cost: £5 per roll (10m x 1m)</p>	 <p>Concrete Cost: £10 per sack covering 15m²</p>	 <p>Polyurethane sheet Cost: £40 per sheet (10m x 2m)</p>	 <p>Steel Cost: £50 per sheet (2m x 3m)</p>
 <p>Bamboo Cost: £1 per 1m cane</p>	 <p>Softwood Cost: £2 per 1m length</p>	 <p>Dung/Soil/Ash/Sand Cost: Free</p>	 <p>Glass Cost: £30 per sheet (2m x 1m)</p>
 <p>Hardwood Cost: £10 per 2m plank</p>	 <p>Corrugated iron Cost: £40 per sheet (2m x 1m)</p>	 <p>Bricks Cost: 50p per brick</p>	 <p>Grass/Reeds/Jute Cost: Free</p>
 <p>Nails Cost: 10p per nail</p>	 <p>Metal fastenings Cost : £5 per fastening</p>	 <p>Nuts and bolts Cost: £1 per nut and bolt</p>	 <p>Rope Cost: £5 per 10m</p>

Costing your home

Instructions: Make a list of the materials you've included in your final design. Cost each material and then total the cost of your home.

Material	Quantity used	Cost per unit	Cost
Example: Softwood	3m	£2	£6

Total cost of home



Beat the Flood

Name: _____

Testing materials for absorbency - results table

Material	Height that the water was absorbed to (cm)			Observations
	Test 1	Test 2	Average height	

Which material absorbed the least amount of water? _____

Testing materials for tensile strength - results table

Material	Weight added to material (g)			Observations
	Test 1	Test 2	Average weight	

Which material was the strongest? _____

Beat the Flood

Name: _____

Material activities summary sheet

Complete this sheet to help you make decisions about the choice of materials for your flood-resistant home.

Material	Does it absorb water/is it waterproof?	How strong is the material? Does it bend?	Cost	Availability	Any other comments

Structures activity sheet

Look at the pictured examples of structures. Cut them out and add them to either the frame or shell structures boxes in the table below.

<p>Frame structures are structures supported from a 'skeleton' frame. The materials need to be strong and often need reinforcing to make the frame stable.</p>	<p>Shell structures are made or assembled to make one piece. The load is spread throughout the whole structure.</p>
<p>Examples of frame structures</p>	<p>Examples of shell structures</p>
<p>Pros</p> <ul style="list-style-type: none"> - Easy to design and build - Parts can be replaced if damaged 	<p>Pros</p> <ul style="list-style-type: none"> - Light - Minimal material required
<p>Cons</p> <ul style="list-style-type: none"> - Joining different parts together can create weaknesses - Braces are often needed to strengthen the building 	<p>Cons</p> <ul style="list-style-type: none"> - A small fault in any part of the structure will weaken the whole structure - More difficult to make

Beat the Flood

Frame and shell structures pictures

Bicycle



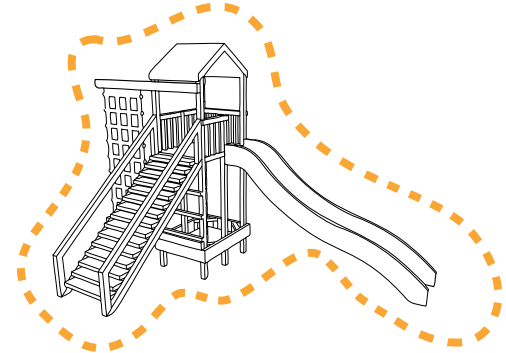
Cardboard box



Chair



Climbing frame



Skeleton



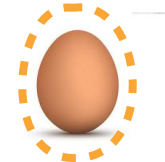
Bicycle helmet



Drinks can



Birds egg



Beat the Flood

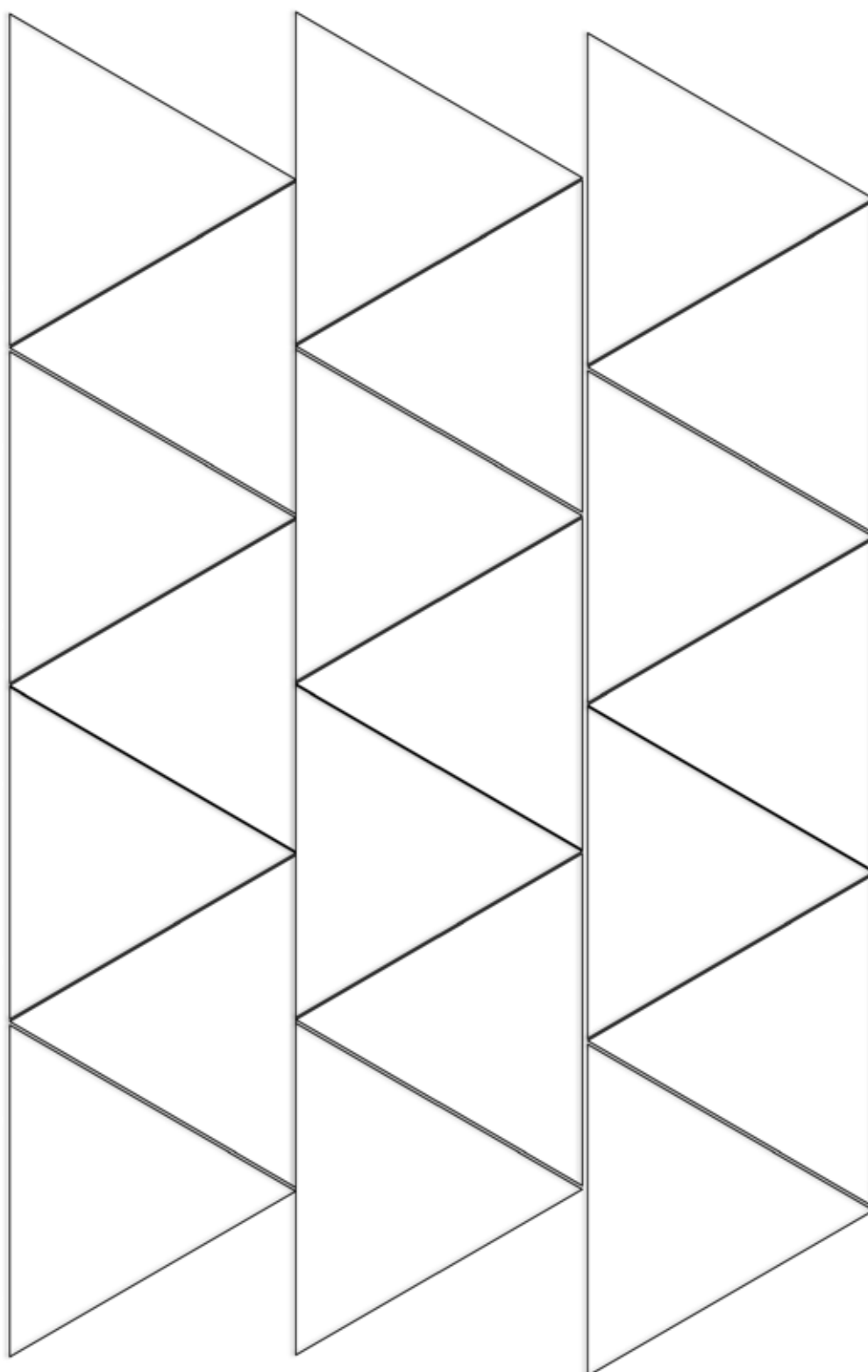
Structures template 1

We suggest that the templates are printed onto card and laminated for pupils to use in the testing structures activity.

Beat the Flood

Structures template 2

We suggest that the templates are printed onto card and laminated for pupils to use in the testing structures activity.



Design Specification

Before developing your ideas for your flood-resistant home, think about the features that you want your home to have, and give a reason why these are important.

Materials

What properties do you need the materials in your home to have?

Suitability for the community/family

What features do you want your home to have to make it suitable for the people who will live in it?

Size

What are the maximum and minimum dimensions of your design?

Construction method

What type of structure do you think best suits the conditions and materials available on the island?

Environmental issues

Will you consider the effect of your choice of materials on the environment?

Cost

What is the maximum cost you can spend on your design?



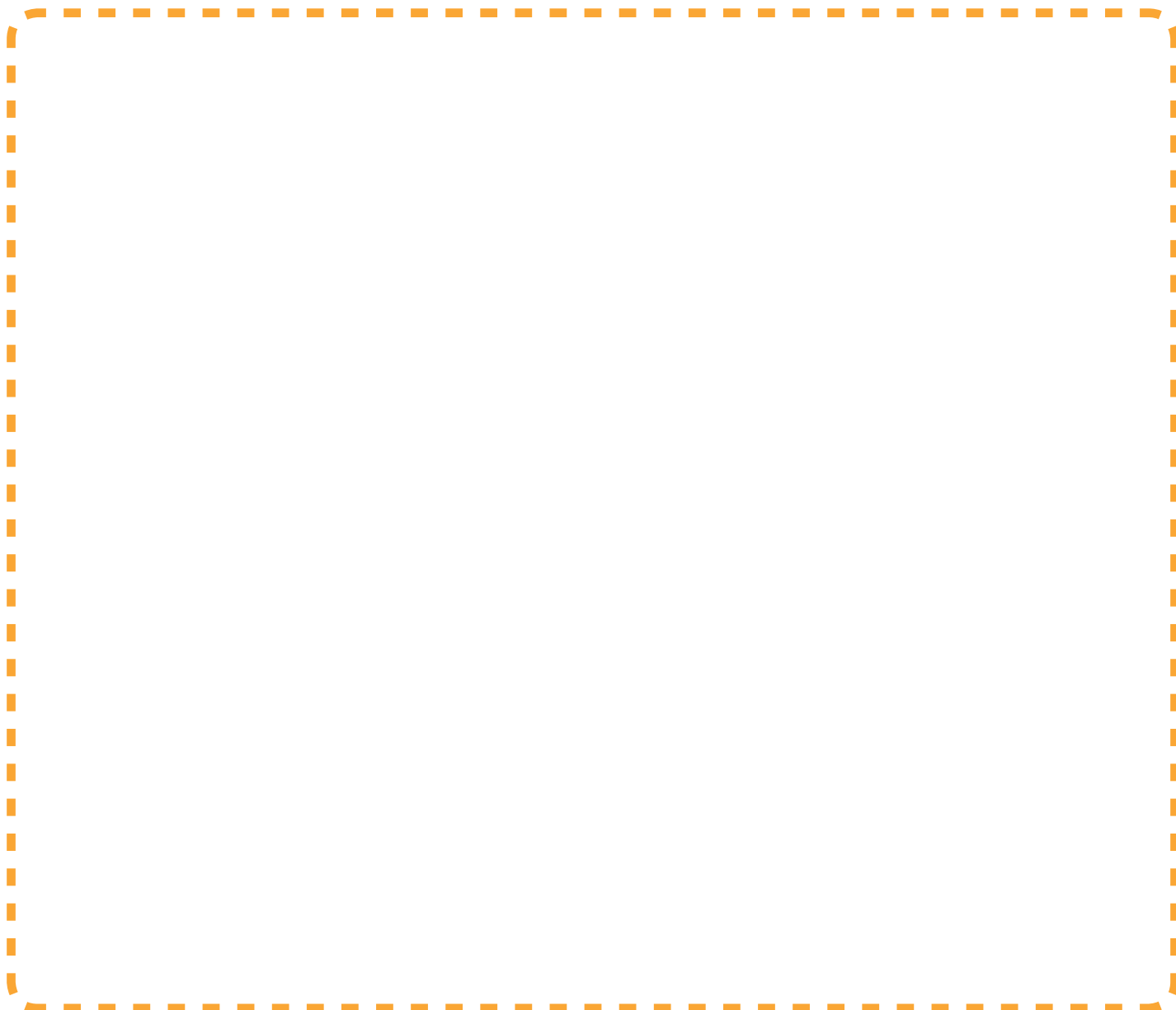
Design ideas

Develop a few ideas for your flood-resistant homes and sketch them below.

Annotate your design ideas with notes alongside your drawings to give additional information.

You can include:

- details of hidden parts such as fixings, openings, interior elements
- information about materials and size
- how your design would be suitable for the community
- how the design meets the specification points



As a group: share your design ideas and compare them with your design specification. Consider which ideas, or which parts of your ideas, meet the specification points the best. Use your individual ideas to select the final design for your group.



Beat the Flood

Names: _____

Final design

Present a final design drawing of your group's idea with annotations to explain its features.



Beat the Flood

Names: _____

Include photographs of your final model, before and after the flood test.

Before

A large, empty rectangular area defined by a dashed orange border, intended for a photograph of the model before the flood test.

After

A large, empty rectangular area defined by a dashed orange border, intended for a photograph of the model after the flood test.

Beat the Flood

Name: _____

How well did they do?

Listen to each group's presentation and give a mark out of 10 for each heading below (0 is the lowest and 10 the highest). Total the score.

Group name	How well did the group understand the needs of their community?	How good was their choice of materials?	How good was their choice of structure?	How good is their overall design?	Did they work well as a team?	How did the model do in the flood test?	Overall score out of 60