

# Beat the Flood

Name: \_\_\_\_\_ Yr Group: \_\_\_\_\_

## Starter questions

You are about to start a new challenge called *Beat the Flood*. Please answer the questions below to help your teacher learn about what you know about flooding before the challenge begins.

1. What do you think are the main causes of flooding around the world?

2. Name 3 countries in the world where flooding happens regularly

3. What do you think the woman in the photo might be thinking? Fill in the thought bubble below.



4. What do you think is the best way a charity can help people who live in areas that flood regularly? Order them 1-5. (Number 1 as your best way of helping and 5 as your least helpful way).

Ways in which charities help people who live in areas that flood regularly	Number 1-5
Offer people somewhere else to live	
Give people money to spend as they wish	
Give people food and clothes	
Provide people with information and training on how to keep safe when the floods arrive	
Provide people with information and skills to prepare for the floods so they won't harm them as much, e.g. how to build flood-proof homes	

5. When you see pictures or hear stories of people living in different countries affected by flooding, do you? Put a ring around one.

Not really care

Care a little

Care a lot

If you do care, do you believe that you might be able to do something to make a difference? Yes/no

If 'yes' what ideas do you have?

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# Beat the Flood

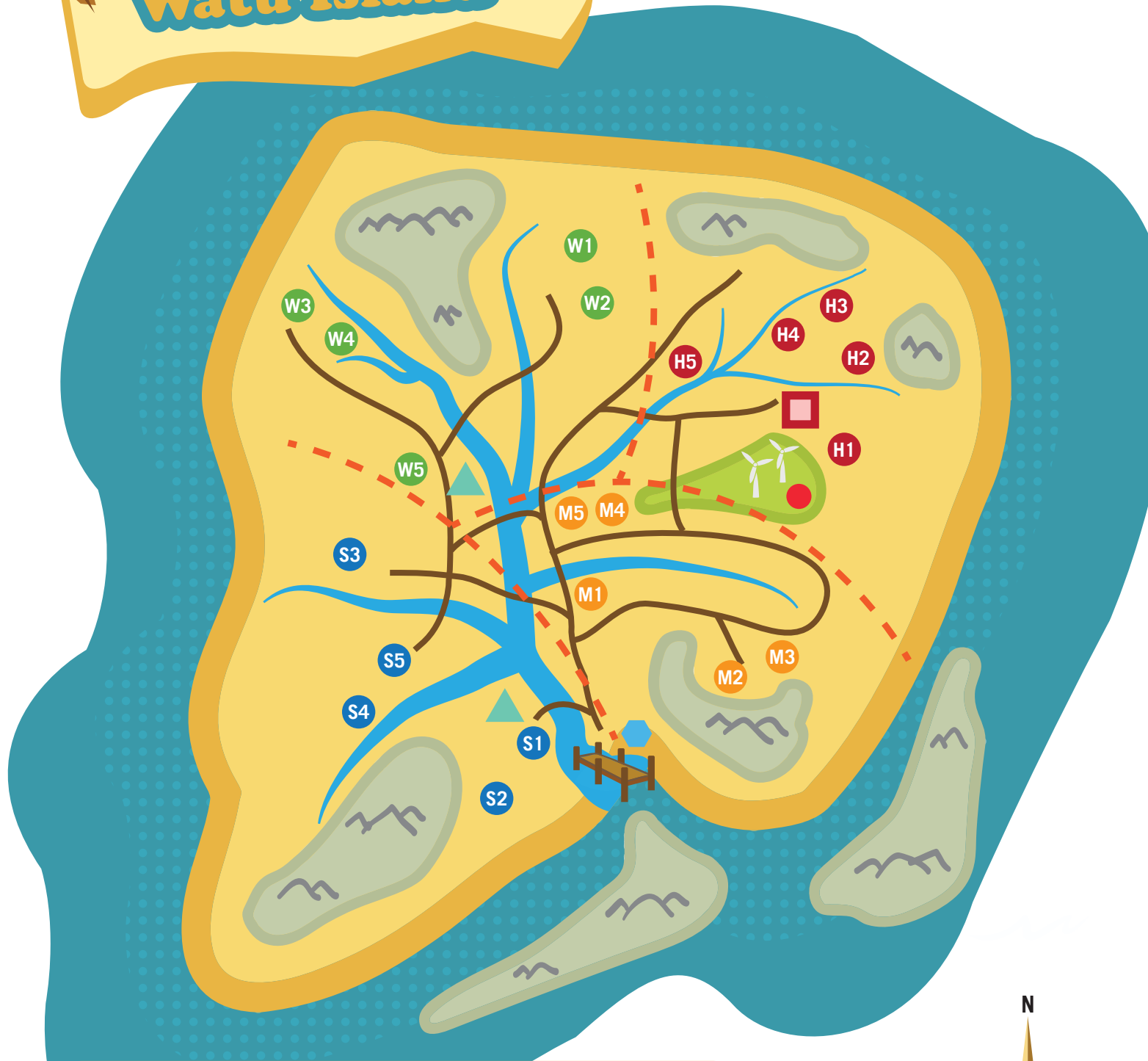
## Where in the world?

Working in small groups, look at the photographs below of people whose lives have been affected by flooding around the world.














Cut out the pictures and discuss where you think the photographs are from before placing them on the world map.

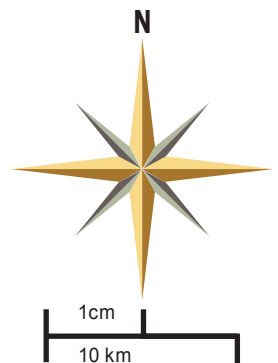


# Watu Island



## Key

- |   |                     |   |                    |
|---|---------------------|---|--------------------|
|  | Savuvi homes S1-S5  |  | Mountain areas     |
|  | Wazenzi homes W1-W5 |  | Forest             |
|  | Hila homes H1-H5    |  | School             |
|  | 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

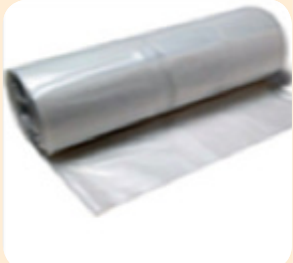
- 🔹 Water-thirsty plants such as bamboo and banana are grown around the houses. They ‘drink up’ flood water and hold onto the soil, helping the ground around the homes to stay intact.

**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 15m<sup>2</sup>



### 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

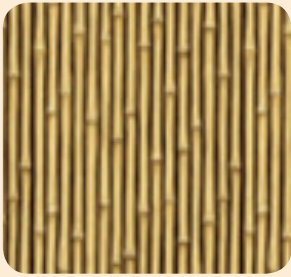


**Properties:** water resistant, prone to rust, strong, recyclable, difficult to cut into sections, non-biodegradable

**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

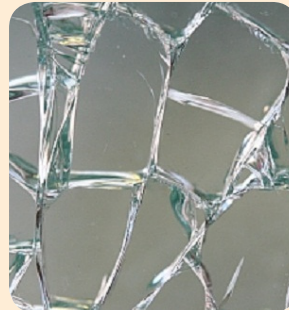
For modelling you could use mud or clay



**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

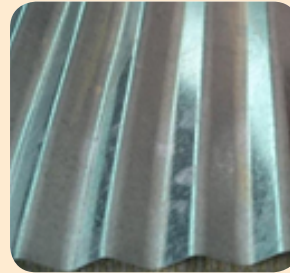
For modelling you could use lolly sticks or balsa wood



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

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

# Beat the Flood

Name: \_\_\_\_\_

## 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? \_\_\_\_\_

# Beat the Flood

Name: \_\_\_\_\_

## 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

# Beat the Flood

Name: \_\_\_\_\_

## 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.

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

# Beat the Flood

## Frame and shell structures pictures

Bicycle



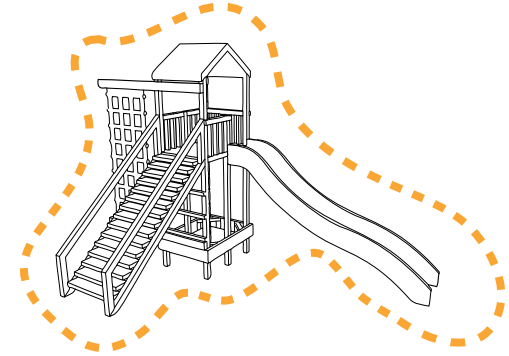
Cardboard box



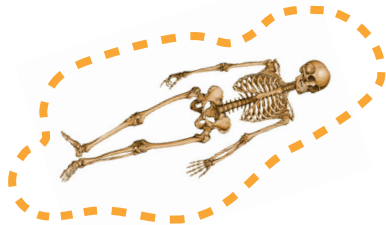
Chair



Climbing frame



Skeleton



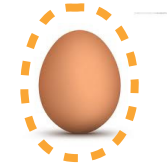
Bicycle helmet



Drinks can



Birds egg



# Beat the Flood

## Structures template 1

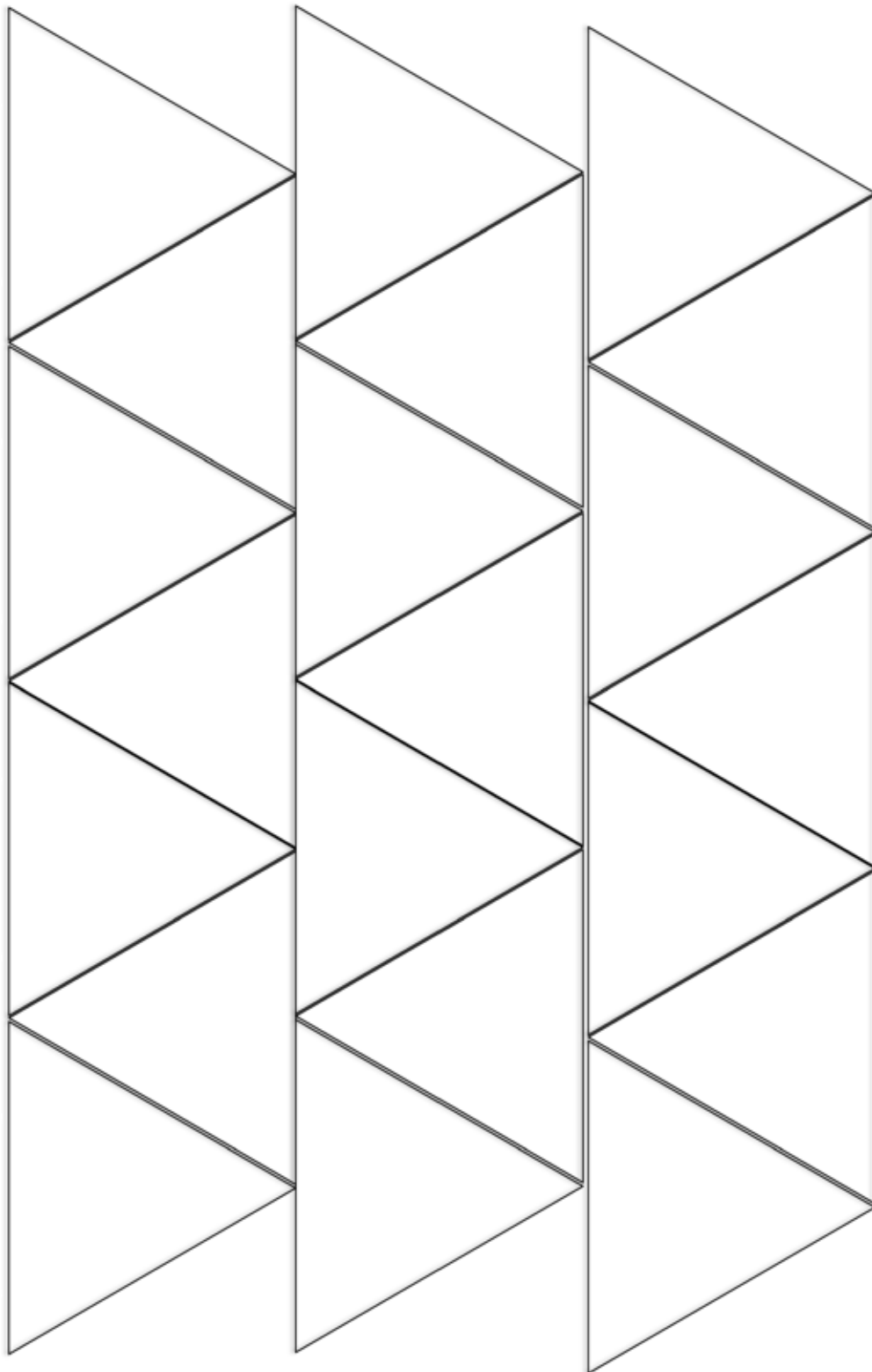
We suggest that the templates are printed onto card and laminated for pupils to use in the testing structures activity.




# 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?

# Beat the Flood

Name: \_\_\_\_\_ Yr Group: \_\_\_\_\_

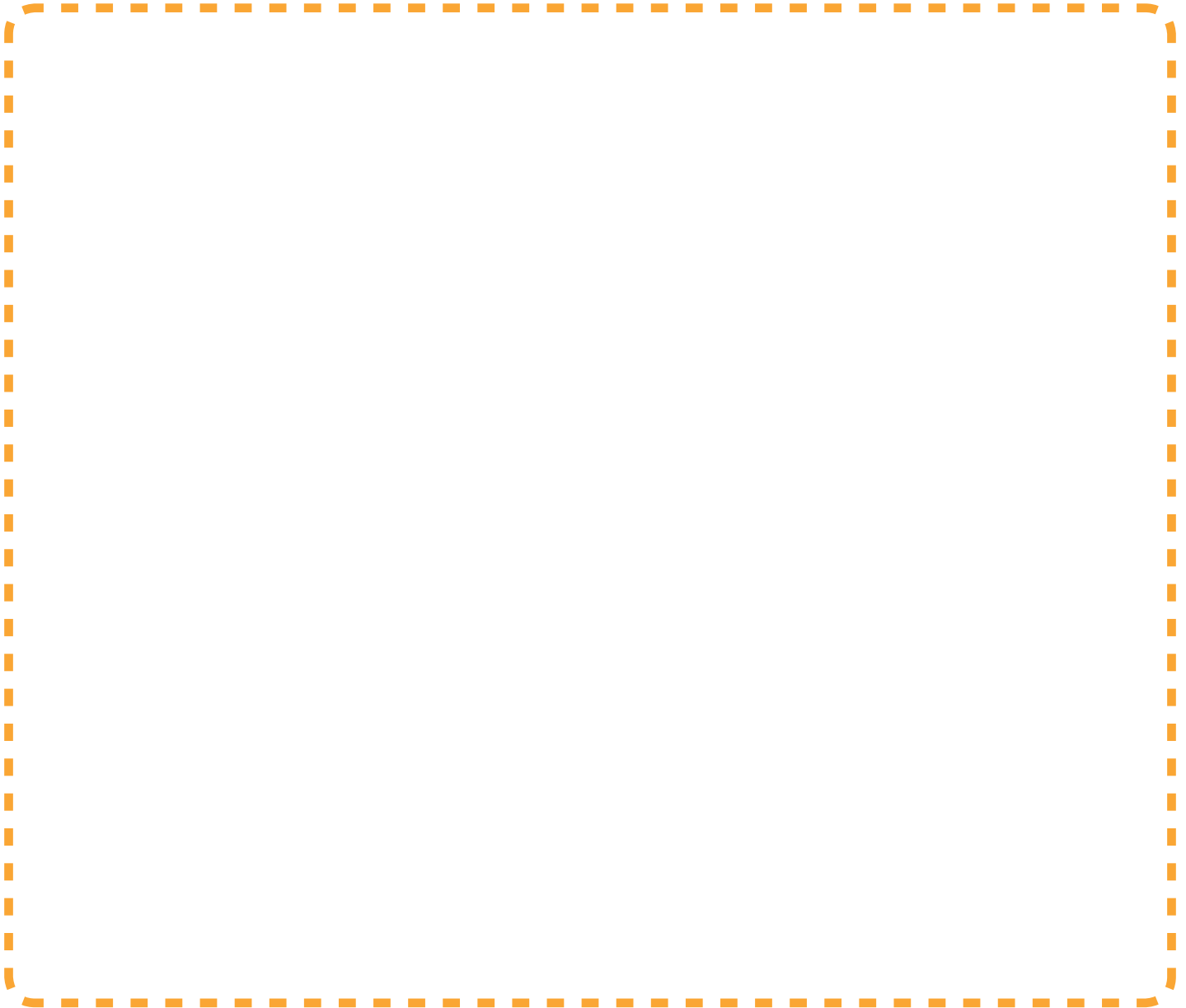
## Design ideas

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 box with a dashed orange border, intended for a photograph of the model before the flood test.

After

A large, empty rectangular box with 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

# Beat the Flood

## World map

Cut out the pictures of people affected by flooding and place them where you think they are from on the world map below.



Which of the people in these photographs do you think would be most devastated by flooding and why?

# Beat the Flood

Name: \_\_\_\_\_ Yr Group: \_\_\_\_\_

## Summative questions

You've just completed a challenge called *Beat the Flood*. Please answer the questions below to help your teacher find out what you've learnt.

1. What do you think are the main causes of flooding in the world?

\_\_\_\_\_

2. Name 3 countries in the world where flooding happens a lot.

\_\_\_\_\_

3. What do you think the woman in the photo might be thinking? Fill in the thought bubble below.



4. What do you think is the best way a charity can help people who live in areas that flood regularly? Order them 1-5. (Number 1 as your best way of helping and 5 as your least helpful way).

Ways in which charities help people who live in areas that flood regularly	Number 1-5
Offer people somewhere else to live	
Give people money to spend as they wish	
Give people food and clothes	
Provide people with information and training on how to keep safe when the floods arrive	
Provide people with information and skills to prepare for the floods so they won't harm them as much, e.g. how to build flood-proof homes	

5. When you see pictures or hear stories of people living in different countries affected by flooding, do you? Put a ring around one.

Not really care

Care a little

Care a lot

If you do care, do you believe that you might be able to do something to make a difference? Yes/no

If 'yes' what ideas do you have?

\_\_\_\_\_  
\_\_\_\_\_