

# BUILDING AN ECO-HOUSE

## A DESIGN AND TECHNOLOGY PROJECT FOR KEY STAGE 2

### OBJECTIVE

In this unit, children learn about eco-friendly houses. They learn that the physical properties of houses can affect how good they are for the environment. They investigate materials that are good for insulation and which materials are appropriate for different uses. They are also shown the use of solar power as a source of energy in the home. The main outcome of this unit will be the design and construction of a model eco-house.



### Story of SolarAid

Solar is at the heart of SolarAid's mission. When the sun goes down the working day ends for millions of people. For millions of others the only option is to ignite kerosene lamps and paraffin candles, which emit toxic fumes into the earth's atmosphere. But with the flick of a switch, we can change that story. Every solar light in someone's hand is an instant win for people and the planet.

Solar is not only important for cooking, but to provide light after the sun sets so farmers can sort their crops, children can study, and midwives can safely deliver babies.

### ▶ Play introduction to SolarAid video

If you'd like to fundraise alongside learning, as part of your support of SolarAid, please get in touch on [info@solaraid.org](mailto:info@solaraid.org). We're here to help every step of the way.



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## INFORMATION NOTES

This pack contains two different approaches for building a model eco-house, dependent on how much time is available.

The first is a complete Design and Technology unit, with links to Science, designed to run over a minimum of four sessions.

The second is designed as a limited-time activity and can be completed in one hour. The pupils work in teams competing to build the best eco-house. Points are assigned to the different eco-measures and the house with the most points wins. The lesson should start with a discussion of ways the pupils think the physical structure of a house could affect our carbon footprints through wasting energy and water.

## USEFUL MATERIALS TO PROVIDE

Craft knife	Sticky tape	Scraps of material	Felt-tips
Glue	Printer paper boxes	Bubble wrap	Straws
Scissors	Mini solar panels	Scraps of card	Rulers
Staplers	LEDs	Pencils	

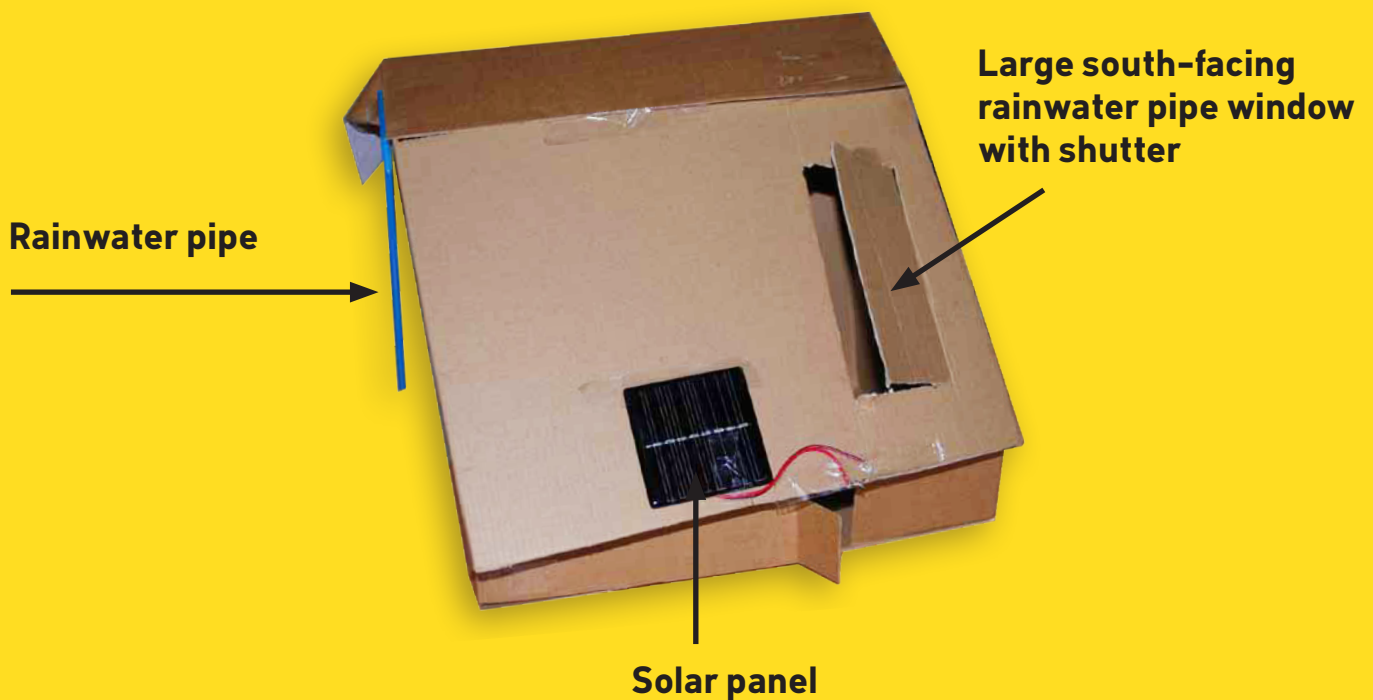
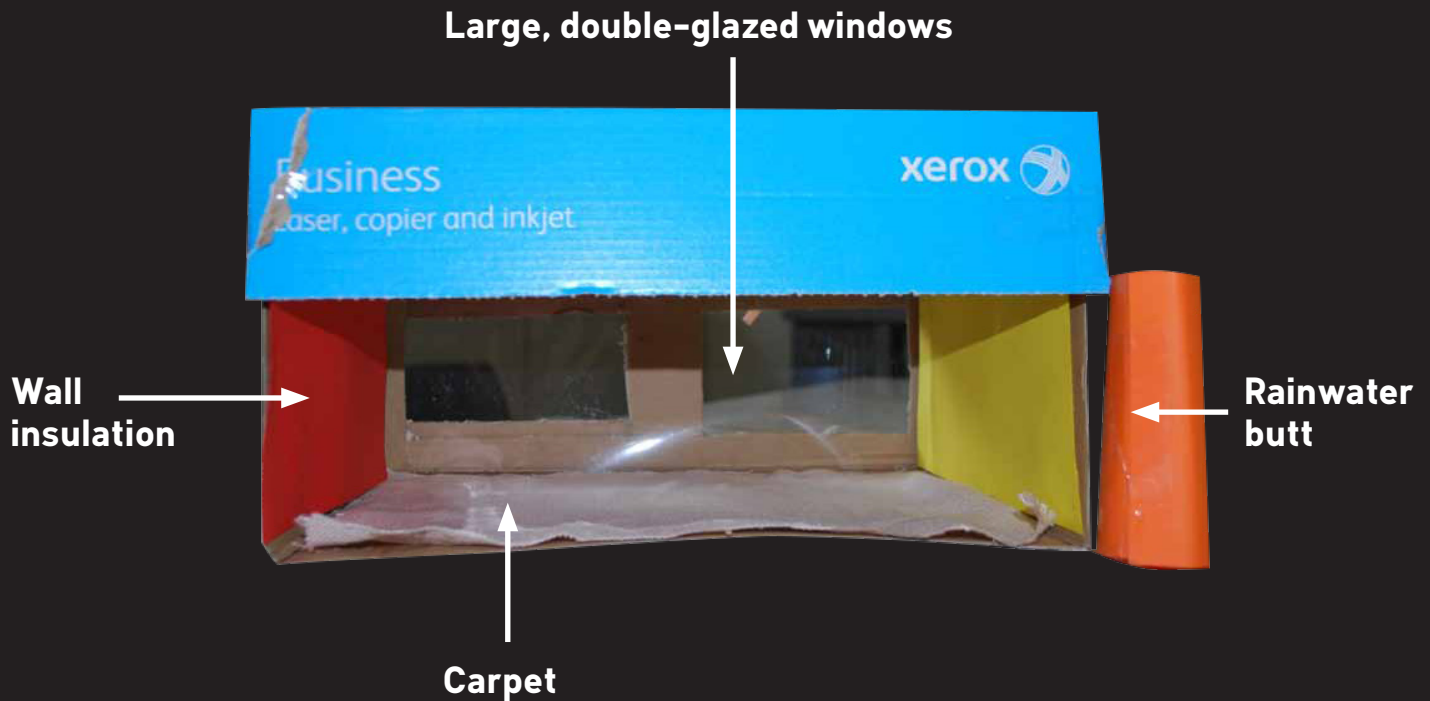
## TIPS AND IDEAS FOR ECO-HOMES

- Photocopier boxes are ideal for converting into model homes. Cut off one side so you can see inside the house and keep the lid for a roof.
- To light the house using the mini solar panels, poke holes into the roof with a sharp pencil, poke the LED legs up through the holes so they stick out onto the top of the roof, then attach the wires of the solar panel and secure with tape.
- Use old scrap material as carpet and curtains, and bubble-wrap as roof and wall insulation. Cut out windows using a craft knife.
- Use laminated sheets of plastic or acetate as windows. Stick one on each side of the window hole to act as double glazing.
- Make rainwater collectors out of cardboard with straws as drain pipes.

## SAFETY

- Pupils will require assistance with cutting with craft knives.
- Take care with the hot water when testing insulation materials.

# EXAMPLES OF ECO-HOMES MADE BY Y5 + Y6



# ECO-HOUSE UNIT: APPROACH ONE

## OBJECTIVE

In this unit, children learn about eco-friendly houses. They learn that physical properties of houses can affect how good they are for the environment. They investigate materials that are good for insulation and which materials are appropriate for different uses. They are also shown the use of solar power as a source of energy in the home. The main outcome of this unit will be the design and construction of a model eco-house. The unit requires a minimum of four sessions.



## RESOURCES

It is helpful if the children have:

- learnt how to mark out, cut and join materials to make frameworks.
- practised ways of showing their design ideas on paper.

## VOCABULARY

In this unit children will use words and phrases relating to:

- designing e.g. modelling, fair test, labelling.
- making e.g. cutting, fixing, measuring, strengthening.
- knowledge and understanding e.g. structure, window, wall, roof, insulation, solar power, waste, energy, heat, double-glazing, draughts.

## RESOURCES

Collection of books/pictures showing different types of houses, including some pioneering eco-houses

Range of materials to test for insulation:

Scraps of fabric, carpet, bubble wrap, foam, scraps of card

Beakers, hot water, thermometers

Craft knife, cutting board, scissors, ruler

Joining materials – glue, staplers, sticky tape

Printer paper boxes or shoe boxes

Mini solar panels, LEDs

Card, straws

Pencils, felt-tips

# INVESTIGATIVE, DISASSEMBLY AND EVALUATIVE ACTIVITIES

**Ask pupils to look at a range of houses. Discuss materials that have been used in building the house.**

- What are the walls made from?
- What are the windows made from? Are they large or small?
- What is the roof made from?
- Where are they getting light from?
- Where does their rubbish go?

**Ask pupils to think of ways the house could be wasting energy and brainstorm their ideas. Explain that they are going to be building a model eco-house incorporating as many ways of making it eco-friendly as possible.**

**Ask them to focus on three main areas:**

- Energy creation.
- Preventing energy waste (light and heat).
- Saving water and reducing rubbish.

## FOCUSED PRACTICAL TASKS

**Ask pupils to look at a range of houses. Discuss materials that have been used in building the house.**

Investigation into materials for insulation. Show pupils several different materials that could be used for insulation. Explain that they will conduct an experiment to see which one is the best at keeping heat in. Each group will require two beakers – one as a control and one to wrap insulation around. They will also require two thermometers. Pupils follow this method:

- 1. Wrap one beaker with insulation.**
- 2. Measure 100cm<sup>3</sup> hot water into both beakers.**
- 3. Record the temperature of both beakers.**
- 4. Start the clock.**
- 5. Record the temperature every 5 minutes for 30 minutes into a table.**

These results can be plotted into a graph. Encourage groups to test different materials, such as bubble wrap, foam, and different fabrics (cotton, wool, carpet). From the class results, decide which materials were the most successful at keeping in the heat.

Pupils can also investigate which materials would be appropriate for the different places that insulation is needed in the house i.e. loft insulation would not be appropriate for curtains.

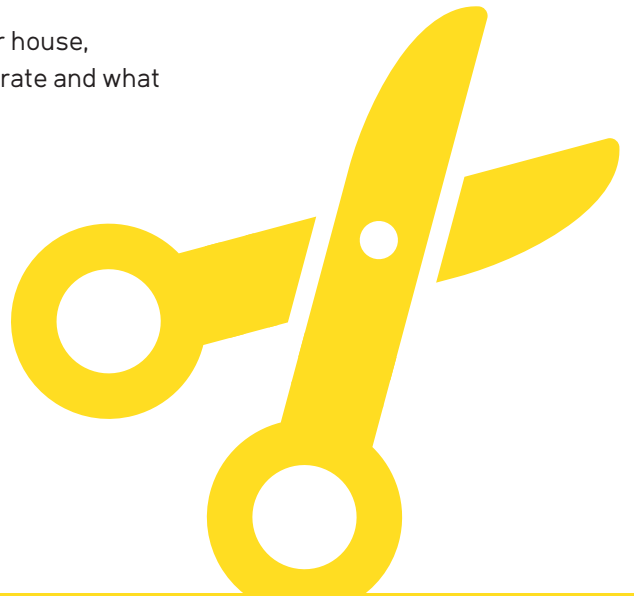
# DESIGN AND MAKE ASSIGNMENT

**The task is for pupils to construct a model of a house, incorporating as many features as possible which will help to save energy, water and waste.**

In groups, pupils brainstorm ideas. Pupils then design their house, labelling all the different eco-features they plan to incorporate and what materials they will use.

If possible, allow pupils to incorporate the mini solar panels and LEDs into their models. Pupils construct the model homes. Encourage them to evaluate their work as it progresses and seek improvements to their first attempts.

When completed, discuss with pupils what they have learnt and ask them to fill out the evaluation sheet.



## EXTENSION IDEAS

**Pupils could investigate items inside the house which are eco-friendly e.g. white goods with A+ energy rating, furniture made from sustainable sources, fabric made from organic materials.**

**Pupils could make a display of their eco-homes or present them in assembly.**



# **BUILD AN ECO-FRIENDLY HOUSE:**

## **APPROACH TWO**

Work in groups to convert a box into a model eco-home. You must use a range of materials to make it as eco-friendly as possible. You will be given small solar panels to light your home.

### **OUR IDEAS TO REDUCE ENERGY WASTE:**

### **OUR IDEAS FOR WASTE AND WATER:**

### **WE WILL NEED:**

### **OUR HOUSE WILL LOOK LIKE THIS:**

# EVALUATION

Now you have completed your house, think about what worked well and what could have been improved.

**OUR ECO-HOUSE LOOKED LIKE THIS:**

**THE BEST THING ABOUT OUR PROJECT IS:**

**OUR PROJECT COULD HAVE BEEN EVEN BETTER IF:**

**I HAVE LEARNED:**



# ECO-HOUSE CHALLENGE

You will work in teams to convert a box into a model eco-home. You will have a limited time. You must use a range of materials to make it as eco-friendly as possible. You will be given small solar panels to light your home.

Each eco-measure will be awarded points – **the house with the most points wins!**

## SKILLS YOU WILL NEED:

Teamwork, Time-keeping, Prioritising, Initiative.



## ENERGY PRODUCTION

Functioning solar-powered light

25 points

## SAVING ENERGY (HEAT AND LIGHT)

Large windows for natural light

5 points

Insulation:

walls

10 points

roof

15 points

floor

10 points

Double glazing windows

15 points

Draught proofing

5 points

Curtains

10 points

## WASTE AND WATER

Water collector for rainwater

10 points

Recycling boxes

5 points

Compost bin

5 points

## BONUS IDEAS

Energy saving appliances

Green roof

Other renewable energy sources

**NOTE: BONUS POINTS AVAILABLE FOR GOOD DESIGN!!**