

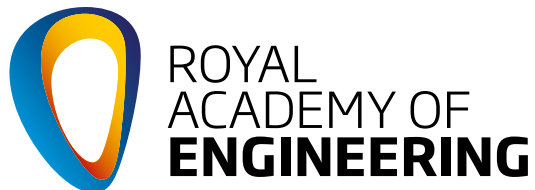
ENGINEERING A BETTER WORLD



Smart Havens Africa

Anne Rweyora, Uganda

A STEM resource inspired by the
Africa Prize for Engineering Innovation



The Shell Centenary Scholarship Fund



ABOUT SMART HAVENS AFRICA

Anne Rweyora is an industrial designer from Uganda.

Anne's team are developing affordable housing options for people struggling to buy their own homes. Anne hopes that Smart Havens Africa (SHA) will provide security for more women in particular in Uganda and allow them to enjoy stable lives, raise families, work or study and have enough disposable income to live. SHA will also provide employment and empower communities.

SUSTAINABLE DEVELOPMENT GOALS

- End poverty in all its forms everywhere
- Achieve gender equality and empower all women and girls
- Decent work and economic growth
- Make cities and human settlements inclusive, safe, resilient and sustainable
- Climate action



Time to reflect

After you have completed the activities in this resource, reflect on how Smart Havens works towards the Sustainable Development Goals shown.

COUNTRY PROFILE

What information about Uganda do you think will be useful to support Anne in this project?

Refer to the Vertical Farm resource to help you build a country profile on Uganda.





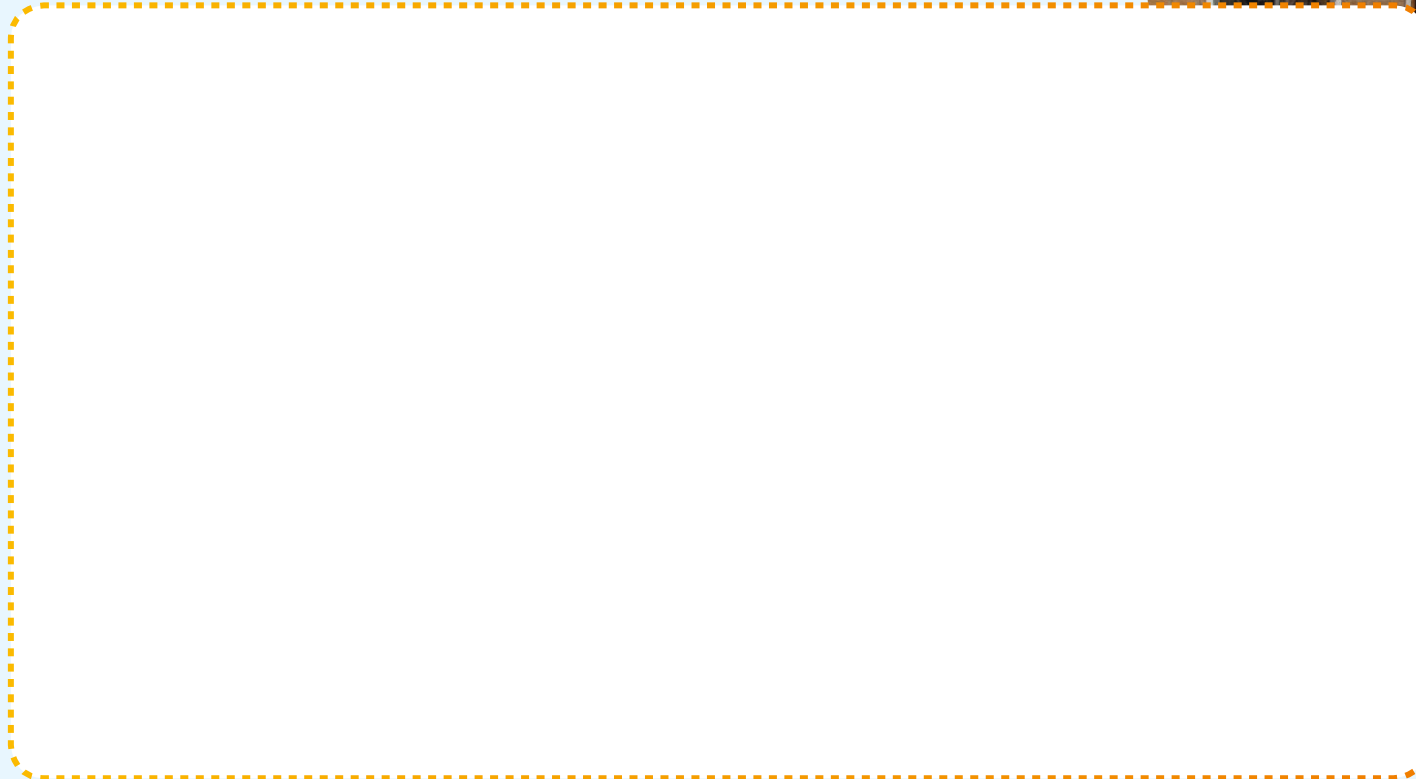
Time to design

The population in Uganda is growing rapidly, so an important part of the design process is ensuring that the homes are sustainable, through both the building materials and the energy sources that supply the homes.

Using the space provided, sketch a plan for a sustainable home.

What features will your home include to make it sustainable?

Think about some of the innovations that you might have seen in the other activities in this resource.



COOLING OFF

As we know from the country profile, it can get very hot in Uganda. We can make good use of the Sun's energy by using solar-powered fans in the SHA homes.

Using your skills from the DEXT Science Set, design and build a solar powered fan. In your design and build, you will need to consider where it will be used and how it will stand. This is an excellent opportunity to recycle and upcycle.

STEP 1

Build your circuit

Using the skills you learned from the DEXT Science Set, you will build a circuit that will power your fan.

- What components will you need for your circuit?
- How will the fan be turned on and off?
- Draw a circuit diagram using appropriate symbols.

STEP 2

Design your blade

Take a look at the different styles of fan blades.

- What design features will increase the flow of air?
- Will more blades create the strongest flow of air?

STEP 3

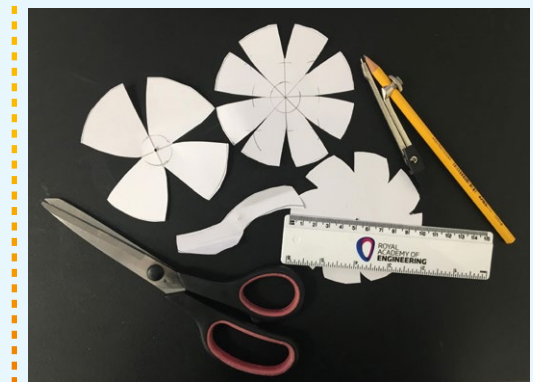
Make prototypes for different blade designs

Materials needed

- Square piece of thin cardboard (old cereal boxes would work well)
- Pencil and ruler
- Scissors
- Pair of compasses
- Plastic blade holder OR Blu-tac

Experiment by **prototyping** different arrangements of fan blades to see which will produce the greatest flow.

Keep the diameter of each of your models the same and just change the number of blades and/or the style of blades.



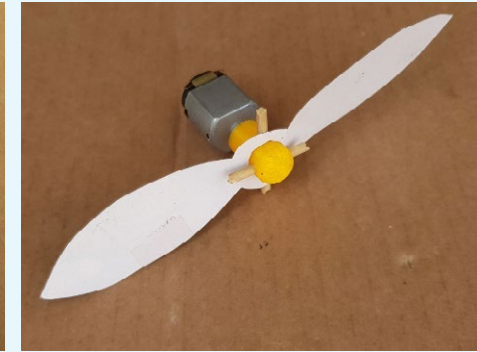
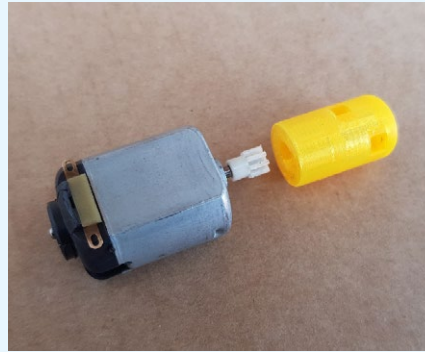
STEP 4

Test your blades

Use the plastic blade holder OR a small amount of Blu-Tack on the motor to hold the blades in place.

Once you have decided on the best blade arrangement, you may want to construct a stronger model of this design.

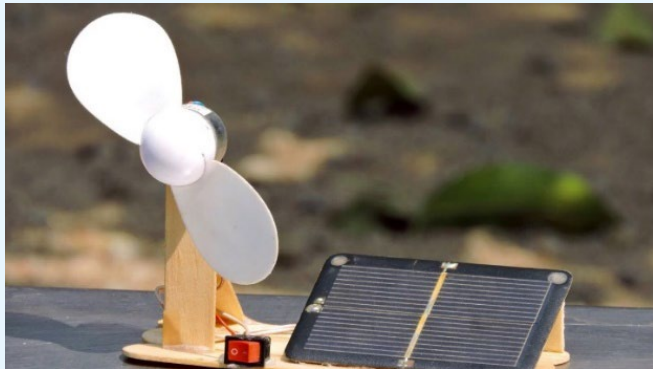
Which arrangement works best for your model? Why do you think?



STEP 5

Build your stand

Using recycled material, you will need to build a structure that will hold your solar-powered fan.



BUZZ ME IN

For added security, the SHA homes might be fitted with alarm systems that will be triggered by unwanted visitors.

Build a circuit with a buzzer that can be triggered by opening a door/window.

What features will your circuit need to have to do this?

In your groups, think about different ways you might be able to do this. We have given you some guidance to help you build the circuit, but you will need to design and make a system that will attach to a door or window.

Draw a circuit diagram using appropriate symbols.

Describe how the components in the circuit transfer energy in different forms.



Materials needed

- Materials to build your circuit
 - buzzer
 - batteries
 - switch
- Thin and thick cardboard
- Aluminium foil (or another conductor)

Students
Tell us what
you think of
this resource!

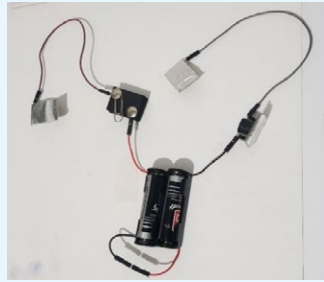
Take our short survey for a chance **to win £500** of robotics/coding equipment for your school.

Scan this QR code on your phone or go to <http://stemresources.raeng.org.uk/student-survey/>



STEP 1

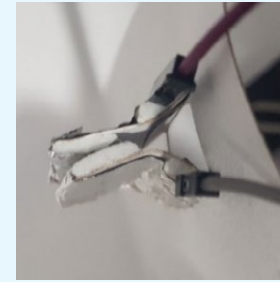
Build an open circuit using a buzzer, two batteries and a switch.



STEP 2

Cut two small pieces of thin card and cover half of each with a similar size piece of aluminium.

Attach to each end of your circuit as per the photo.



STEP 3

Cut a rectangular piece of thick cardboard with a small square opening at one end (see photo).

Stick the paper to either end of the opening so that the aluminium touches.

What happens to your circuit when the aluminium parts touch?



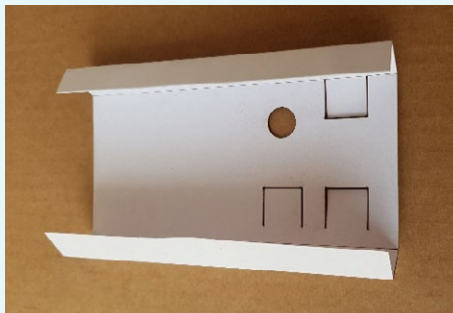
STEP 4

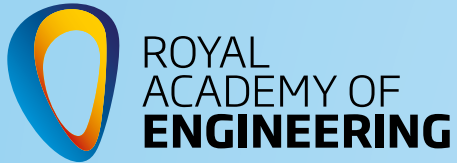
Design and make a system that will break the circuit when a door or window is closed.



STEP 5

Design and make a device that will hold and conceal your alarm system.





ROYAL
ACADEMY OF
ENGINEERING

Royal Academy of Engineering

As the UK's national academy for engineering and technology, we bring together the most successful and talented engineers from academia and business - our Fellows - to advance and promote excellence in engineering for the benefit of society.

We harness their experience and expertise to provide independent advice to government, to deliver programmes that help exceptional engineering researchers and innovators realise their potential, to engage the public with engineering and to provide leadership for the profession.

We have three strategic priorities:

- Make the UK the leading nation for engineering innovation and businesses
- Address the engineering skills and diversity challenge
- Position engineering at the heart of society

We bring together engineers, policymakers, entrepreneurs, business leaders, academics, educators and the public in pursuit of these goals.

Engineering is a global profession, so we work with partners across the world to advance engineering's contribution to society on an international, as well as a national scale.



Royal Academy of Engineering
Prince Philip House, 3 Carlton House Terrace,
London SW1Y 5DG

Tel: +44 (0)20 7766 0600
www.raeng.org.uk
[@RAEngGlobal](https://twitter.com/RAEngGlobal) [@EduRAEng](https://twitter.com/EduRAEng)

Registered charity number 293074

Front cover images: Shutterstock.com

Please recycle this resource (the cover is treated with recyclable laminate)

ENGINEERING A BETTER WORLD