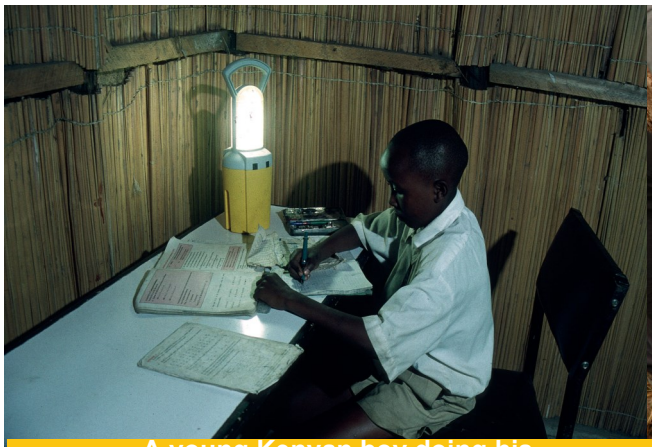
GLOBAL PROJECT IDEAS

# AFFORDABLE AND CLEAN ENERGY

7 AFFORDABLE AND CLEAN ENERGY

**It's hard to imagine a life without energy. No energy to charge your mobile phone, to provide you with light in the evenings or to cook your food. If we want enough energy for everyone on the planet we are going to need to find more renewable, sustainable and affordable solutions.**



A young Kenyan boy doing his homework by solar lantern

Biogas, Nepal

Have you heard about the **Sustainable Development Goals (SDGs)** or **Global Goals?**

These are 17 Goals that were put together by global leaders from many countries around the world to **end poverty**, **protect the planet and ensure prosperity for all** by 2030.

To find out more about the Global Goals, you can watch a video about them here vimeo.com/181766755 and/or go to globalgoals.org

One of these, **Global Goal 7** is about having access to **affordable and clean energy**, so that shows how important it is in lifting people out of poverty.

Today, **1.6 billion people live their lives without any access to electrical energy.** That's about 1 in every 6 people on our planet. This means they can't switch on a kettle, turn on a lamp, or power a fridge. To find out what this might be like, and how then having energy changes lives watch youtube.com/watch?v=usISdE-WSWU

Targets for Global Goal 7 include:

- By 2030, ensure universal access to affordable, reliable and modern energy services
- By 2030, increase substantially the share of renewable energy in the global energy mix

These are the targets that the use of STEM knowledge and skills can help us reach.

**SOME IDEAS TO GET YOU STARTED**

**We hope you will do a lot of research yourself, looking at websites, videos etc. so that you get a clear picture of what is happening in the world before you start designing your Global Project. To help you we have some ideas and links to things you might like to look at - all related to affordable and clean energy. Don't feel you have to stick to these though; what you do is up to you!**

**The main thing to keep in mind is how STEM skills can help deliver this Global Goal, either in Europe or a developing country.**

## Making Energy

There are many different ways electricity can be made. For the survival or our planet we need to reduce the amount of energy we produce by burning fossil fuels and increase the amount of other, cleaner, renewable energy sources.

### Small-scale wind power

Producing energy from wind power is one solution used in the developing world.

You could investigate when this type of energy is used and some of the differences between wind turbines in Europe and in the developing world. Maybe the challenge you create could be about building a working model of a wind turbine that could be used either in Europe or in a country in the developing world?

To see examples from the developing world go to practicalaction.org/smallscale-wind-power-1

For a case study go to bit.ly/schscs

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## Solar power

Solar energy can be produced very cheaply. It can be used to produce electricity for lighting, heating and cooking as well as powering generators that can be used to power machinery used for a small business. Could your design a challenge around making use of this source of energy?

For an example of how solar power can be used to pump water to practicalaction.org/solar-powered-water-pumps

To see how solar power can change lives go to practicalaction.org/videos-energy and watch the videos '*Dying for a drink'* and '*How one lamp makes a difference'.*

For a case study of a solar powered water pump in Kenya go to bit.ly/schscs

## Hydro power

Producing energy from water is something that can be done on a medium/large scale in certain areas. Maybe you could design a challenge around building a model system suitable for your own location or for somewhere in Kenya?

For general information on micro-hydro go to practicalaction.org/micro-hydro-power.

Here is a video on micro-hydro in Kenya bit.ly/2ccHqiE.

For a case study on micro-hydro in Zimbabwe go to bit.ly/schscs

## Biogas

Biogas is a technology being piloted on a relatively small scale in Europe. Are there are any projects near you? In the developing world biogas is often a welcomed by-product of a household waste disposal system.

Could you design a challenge around creating a small biogas system safely?

**Children in Zimbabwe playing with an irrigation scheme powered by micro-hydro**

**Children in Kenya celebrate a solar water pump providing clean water after years of drought**

Have a look at this video of biogas in Bangladesh: practicalaction.org/video-marvellous-microbes

For a case study of biogas in Sri Lanka go to bit.ly/schscs

## Energy for cooking - Biomass

Many different kinds of fuels can be used for cooking. People in the developing world change from using wood and dung fuel to kerosene and liquid-petroleum gas (LPG) when they can afford it.

Maybe your challenge could be focused on finding what kind of wood has the greatest energy content, or what materials make the best biomass.

## Products powered by renewable energy

Many products we use such as phones are powered by electricity from the national grid which may include some electricity produced by renewable energy sources but is mostly electricity produced by burning fossil fuels. How about a challenge that is about designing a way of powering a common product such as a phone or an iPad using renewable energy source?

PRACTICAL ACTION

MICRO-HYDRO POWER

technical brief

Introduction

Water power can be harnessed in many ways; the most common way is to use a turbine which is turned by water moving in a controlled manner. It is a technology that has been used throughout the world, by a diverse range of societies and cultures, for many centuries.

Large dams hold water which can be used to provide energy for industry and grid electrification systems. Smaller systems can provide energy to remote regions without the need to build dams.

Table 1, below outlines the categories used to define the power output form hydropower. Micro-hydro power is the small-scale harnessing of energy from falling water, for example, harnessing enough water from a local river to power a small factory or village. This technical brief concentrates on micro-hydro power.

Water powered mills have been in use for nearly a thousand years. In Europe, Asia and parts of Africa, water wheels were used to drive industrial machinery, such as mills and pumps.

The first effective water turbines appeared in the mid 19th century and these quickly replaced the older water wheels in many applications. In contrast to water wheels and the early turbines, modern turbines are compact, highly efficient and capable of turning at very high speed. Hydropower is a well-proven technology, relying on a non-polluting, renewable and indigenous resource, which can integrate easily with irrigation and water supply projects. China alone has more than 85,000 small-scale, electricity producing, hydropower plants.

Figure 1: The Tunga-Kabiri micro-hydro power scheme, Kenya, showing the power house and penstock. Photo: Practical Action / Zul Mukhida.

| | |
|---|---|
| Large- hydro | More than 100 MW and usually feeding into a large electricity grid |
| Medium-hydro | 15 - 100 MW - usually feeding a grid |
| Small-hydro | 1 - 15 MW - usually feeding into a grid |
| Mini-hydro | Above 100 kW, but below 1 MW; either stand alone schemes or more often feeding into the grid |
| Micro-hydro | From 5kW up to 100 kW; usually provided power for a small community or rural industry in remote areas away from the grid. |
| Pico-hydro | From a few hundred watts up to 5kW |

Table 1: Classification of hydropower by size.
kW (kilowatt) - 1000 Watts; MW (megawatt) - 1 000 000 Watts or 1000 kW

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## Useful Links

**UN Global Goals – energy**
un.org/sustainabledevelopment/energy
Information about Global Goal number 7 – clean and affordable energy.

**Global Goals - energy**
globalgoals.org/global-goals/modern-energy/
User friendly website with information on Global Goal 7—Clean and affordable energy.

**Global network on energy for sustainable development**
gnesd.org
A global network of centres of excellence tackling issues relating to energy, including energy access. Website includes useful publications and data.

**Global Issues**
globalissues.org
This website looks into global issues that affect everyone and aims to show how most issues are inter-related.

**Technical briefs from Practical Action**
practicalaction.org/technical-briefs-schools-energy
Technical information on energy solutions

**Renewable World**
renewable-world.org
A charity tackling poverty through renewable energy

**Unilever**
youtube.com/watch?v=H2ULDepMiEk
#GlobalGoals 7: Affordable and clean energy – can you make it happen?

**Practical Action's main energy page**
practicalaction.org/energy
Information about Practical Action's work on energy

**Practical Action's – blogs**
practicalaction.org/blog/category/programmes/energy/
Blog thread about energy from Practical Action's staff

**The Independent**
bit.ly/indengart
Article on how the developing world spends more money on renewable energy than the developed world.

**Greenbiz article**
greenbiz.com/article/fight-over-how-power-developing-world
Article 'The fight over how to power the developing world'.

**Power for All**
powerforall.org/#energy-access-imperative
A collective of organisations dedicated to delivering universal energy access before 2030.

**Worldometers**
worldometers.info
Basic 'real time' data including data on energy

**Videos on energy**
practicalaction.org/videos-energy
Videos showing some of Practical Action's solutions

**Energy Images**
practicalaction.org/energy-image-gallery
Images of renewable energy solutions

Wind turbine in Nepal