MAKE YOUR OWN GRASS BOILER

Goal(s):

Through making their own very basic grass boiler, the pupils will see the full potential of renewable energy. This can be extended to more sophisticated examples.

General description of the activity:

One group could make the grass boiler, while another group makes the sun boiler (see other activity sheet), so that both ways of water heating from renewable energy sources can be compared. Full instructions on how to build the boilers is provided in illustrated work sheets that come with both activities (see 'Aids' below).

Required materials:

- Large bucket, at least 20 litres;
- Hose or plastic tube of about 2 metres long, as found in gardening or aquarium pet shops;
- Tap or a clamp;
- Funnel;
- Thermometer;
- Pile of freshly cut grass for fermentation.

Required pupil skills:

Knowledge of litres, metres and the concept of 'biomass'.

How does this activity fit into the curriculum:

General Science, Biology, Physics, Chemistry, Mathematics, Speaking & Listening and working in a group.

Safety issues:

The pupils should be aware that the water in the boilers can be very hot.

Individual steps of the activity:	Required time:
1. Explain the purpose of the experiment. Refer to the use of renewable energies and biomass in general, and explain their importance in the fight against climate change and the depletion of fossil fuels. 2. Explain the different forms of renewables and their applications, i.e. water heating, production of electricity, etc.	Introduction and preparation of materials – 1 lesson
3. Show examples of energy production through fermentation of biomass. In most countries you can ask the help of NGO's or agencies specialized in renewable energy, which often have demonstration models for schools. Otherwise a visit of one of the local renewable energy sites or biomass powers stations could be arranged. The pupils could research this on the internet. 4. Start collecting the materials for the models. Hand out the work sheets, so the pupils can start making the models (see Aid 1 below). The work sheets will give a full description and illustration of both the grass boiler and the sun boiler. It is very simple and good fun to make one or the other, or preferably both! 5. The water in the grass boiler will start warming more slowly than in the sun boiler, however, the good thing is that the heat generation in the grass boiler doesn't depend on the weather. It can even stay in the class room if that's easier, although it might smell a bit of decomposing grass. After a week the first temperature increases should be measurable. After this, the temperature can be measured on consecutive days. 6. Discussion of results, by comparing and analyzing the temperature changes. These experiments can be compared with examples of more sophisticated and large scale applications of water heating using renewable energy.	Building, experiment and analysis – 1 or 2 lessons (depending if one builds one type or two boilers)

Suggestions for combination with other AL activities:

"Tiny drops but a huge waste of water" – Measurement of water waste due to dripping taps in the school.

"Throwing money down the drain" – Saving water at school

"Make your own sun boiler" – Exploiting another form of solar energy

[The listed activities above may change when all the activity sheets have been finalised.]

Variations:

Increased complexity of the experiment: Mark the temperature changes of the water in the grass boiler every day and compare with the indoor/outdoor temperature of the room (mark time of day).

Composting: Similar experiments and temperature measurements, as with the grass boiler, can be carried out if the school has a compost heap. This can show the similarities between composting and fermentation of biomass (biomass being a 'waste' product from the garden and agriculture).

Available aids:

Aid 1 – Illustrated building instructions

Aid 2 – Table for recording temperature changes

Aid 3 – List of websites with demonstration models and education materials

Illustrated building instructions

Table for recording temperature changes

Date	Outdoor/room Temperature	Water Temperature	Remarks

List of websites with demonstration models and education materials

Belgium – www.apere.org

[Additional sites should be suggested by the individual partners]

Search words:

Energy Topic	General topic	Educational subject	Age level
Transport	General sustainable development	**Science**	6-8 years
Space heating & cooling	**Renewable energy**	**Physics**	**9-10 years**
Hot & cold water	Energy efficiency (saving)	**Arts & crafts**	**11-12 years**
Lighting	CO_2 wise transport	**Biology**	
Electric appliances		**Mathematics**	
		Literacy	