

The BLOOM School Box

Future Classroom Scenario

How poop will change the world

This scenario is part of the BLOOM School Box, which consists of a set of five Future Classroom Scenarios combining bioeconomy into science, technology, engineering and mathematics (STEM) subjects. These resources were developed and tested in classrooms by 20 BLOOM expert teachers from 10 different countries.

This Future Classroom Scenario has been developed as part of the BLOOM project, using the methodology of the Future Classroom Toolkit (<http://fcl.eun.org/toolkit>).



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Area / Subject

In which subject(s) or area of expertise can the scenario be used?

Subjects: Physics, Chemistry and Biology, both primary and standard level

Duration: This learning scenario contains 4 main parts and it takes 90 minutes to implement it.

Age of students: 13-15 years old.

Alternatively, it can be adapted to primary-school aged students, for 120 minutes. **Age of students:** 10-12 years old.

Relevant Trends

Relevant trend(s) the Scenario is intended to respond to. E.g. at <http://www.allourideas.org/trendiez/results>

Project-based learning: Students get fact-based tasks, problems to solve and they work in groups. This kind of learning usually transcends traditional subjects.

Collaborative learning: A strong focus on group work.

Lifelong learning: Learning does not stop when leaving school.

Mobile learning: we get access to knowledge through smartphones and tablets. It is learning anytime, anywhere.

STEM learning: Increased focus on Science, Technology, Engineering and Mathematics.

Visual search and learning: Images and multimedia are more powerful than verbal stimuli.

Open source learning: Teachers copy, share, adapt, and reuse free educational materials.

BYOD (Bring your own device): Students bring their own mobile devices to the classroom.

Learning materials: Shift from textbooks to web resources and open source books.

Learning Objectives and Assessment

What are the main objectives? What skills will the learner develop and demonstrate within the scenario? (e.g. 21st Century Skills). How will the progress in achievement be assessed, ensuring the learner has access to information on their progress so they can improve?

The main objective of this scenario is to learn about energy and ways we can produce energy.

Skills that students develop:

- Analytic thinking - comparison of different types of energy production
- Communication and collaboration - working in groups to finish a task
- Creativity - making of their own brochures
- Digital citizenship - use of ICT and new technology

Progress will be **assessed** with an online quiz and with feedback from students.

Outcomes of this scenario:

- All learners will learn about the term 'bioeconomy' and implement this term in everyday life. All learners will learn about biomass, fossil fuel and renewable energy sources.
- All learners will discover, through practical work and worksheets, positive and negative facts about biomass, fossil fuel and renewable energy sources.
- Most learners will learn how to write a web brochure in pdf format.
- Some learners will present their web brochure about biomass, fossil fuel and renewable energy sources.

Learner's Role

What sort of activities will the learner be involved in?

Learners will be involved in the following activities: group work, reading, watching and listening, investigating, demonstrating and creating brochures.

Students will:

- 1. Discuss** about energy, the ways of producing energy right now. Discuss about bioeconomy and ways of producing energy in the future (including human waste and animal waste), and how much people know about bioeconomy via a short video in which students interview by-passers about bioeconomy.
- 2. Listen and watch** about bioeconomy and biomass.
- 3. Practice** differentiating fossil fuels from biomass and renewable energy sources (investigate, practice, design brochure, present brochure).
- 4. Conclusion:** Quiz about energy/bioeconomy.

Tools and Resources

What resources, particularly technologies, will be required?

To carry out this lesson, three laptops or PCs and, if possible, one printer are necessary to print out the prototype of brochures that each group will produce. Internet connection is desirable but the lesson can be implemented as an “offline” one.

For the online quiz, students will need their own device (smartphone) with internet connection.

Tools needed for the lesson (See in the [Annexes](#)):

- Introductory presentation
- Video: interviews
- Presentation on bioeconomy and biomass
- Useful notes about practical work
- Handouts for different groups (3): biomass, fossil fuels and renewable energy
- Handout (1): How to make a brochure?
- Kahoot quiz

Learning Space

Where will the learning take place e.g. school classroom, local library, museum, outdoors, in an online space?

Learning will take place in a school classroom.

Future Classroom Scenario Narrative

The detailed description of the activity

For students aged: 13-15

The learning scenario is divided in 4 main parts (90 min, age of students: 13-15)

1) INTRODUCTION (9 min)

The detailed description of the activity

For this part, use the introductory presentation from Annex 1.

- To start the lesson, the teacher asks the class a simple question: “What do you think will change world in next 50 years?” To which, most student will answer one of the following: technology, robots, cars, etc. The teacher answers: “Poop will change the world!”
- The teacher measures the knowledge of students about bioeconomy and biomass
- Optional: If possible, the teacher displays a video including interviews about the general knowledge of bioeconomy and explains main facts about it. The class discusses the content of the video. During the discussion, every student can state his or her opinion and say few words. Here are some leading questions:
 - Do people know enough about bioeconomy? Why is that so? What does that depend on?

2) BIOECONOMY 101 (15 min)

For this part, use the presentation about bioeconomy from Annex 2.

- The teacher gives a short lecture about bioeconomy, biomass and the ways we can use animal waste to produce energy.
- The class defines facts about bioeconomy.
 - Define biomass, what it can be used for and discuss its different types. Explain how to get energy from biomass. Explain positive and negative aspects of producing energy from biomass. Explain how to get new products from human and animal waste.

3) GROUP WORK (56 min)

- For this part, use the following resources, from Annex 3:
 - Handout about biomass -> for Group 1
 - Handout about fossil fuels -> for Group 2
 - Handout about renewable energy -> for Group 3
 - Useful notes about practical work
 - Handout: How to make brochures?
- The teacher divides students into 3 groups.
- Every group reads short learning materials the teacher provides about fossil fuels, renewable sources of energy and biomass (see Annex 3).
- Each group is given a topic: 1) fossil fuels as energy; 2) biomass as energy; 3) renewable energy sources. Each group is provided with materials for their research and a laptop for internet search.
- After carrying out the research, each group will carry out practical work, which is explained in their materials.
- Each group needs to produce brochure that represents key features about given topic and pros and cons about their source of energy. After that they need to present their work to others.

4) EVALUATION (10 min)

Last part is evaluation via online quiz. As a conclusion, the students will participate in an online Kahoot quiz. It is possible to use [this Kahoot quiz](#) [in English] or adapt it to fit your classroom.

For students aged: 10-12 (PRIMARY STUDENTS ADAPTATION)

The learning scenario is divided into 4 different parts (120 min, age of students: 10-12 years old).

1) INTRODUCTION

The detailed description of the activity

- To introduce the topic, the class creates a brainstorming mind map. With the help of the teacher, students elicit the information that they have about the topic. The main points could be: different types of energy, renewable energy, reduce, reuse, recycle.
- The teacher introduces the new vocabulary. First, students watch a short video [in English] about the dangers of wasting energy.
- The teacher introduces students to bioeconomy. Students will watch a video as well. [in English]
- For this section, use the presentation in Annex 4.

2) BIOECONOMY 101

- To practice the vocabulary about bioeconomy, students participate in an activity.
- For this, use the activity in Annex 5.

3) GROUP WORK

- Students are divided in heterogeneous groups of 4. In groups, they discuss and think about different questions:
 - What does it mean to “have treasures in the trash?”
 - What can we do to protect our environment?
 - What is the cycle of general waste?
 - What is the cycle of human waste?
- After students share their hypotheses, the teacher explains the cycle of general waste and human waste and how we can take advantage of them to take care of the environment.
- For this section, use the presentations in Annex 6.
- Show the following video to students:
<https://www.youtube.com/watch?v=mb9XdsxkIww> [in Spanish]

4) EVALUATION

- Once students have learnt the vocabulary of the unit and the process and importance of biomass, the teacher helps them revise their knowledge with a Kahoot quiz:
 - <https://goo.gl/JgtS48> [in English]
 - <https://goo.gl/Wvuxc8> [in English]
- Optional activity: Students in groups of four create an advertisement video, explaining how important it is to take advantage of the waste.

Learning Activities

Link to the Learning Activities created with Learning Designer (<http://learningdesigner.org>)

<https://v.gd/OJQSfj> (Secondary school) (Full text available in Annex 7)

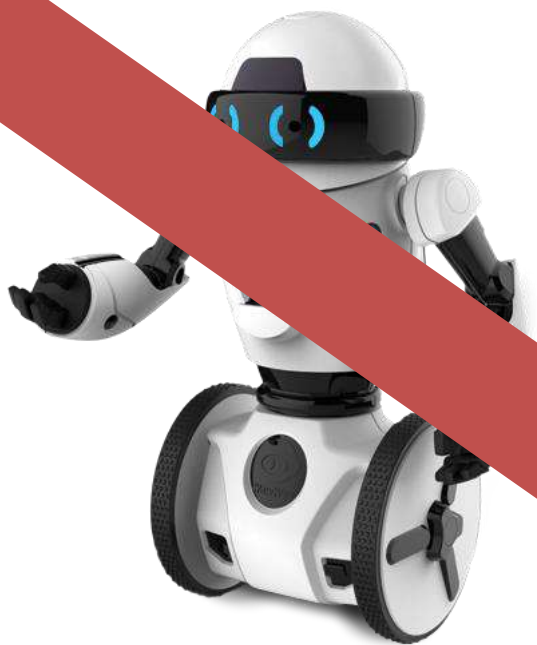
<https://v.gd/q2AJAz> (Primary adaptation) (Full text available in Annex 8)

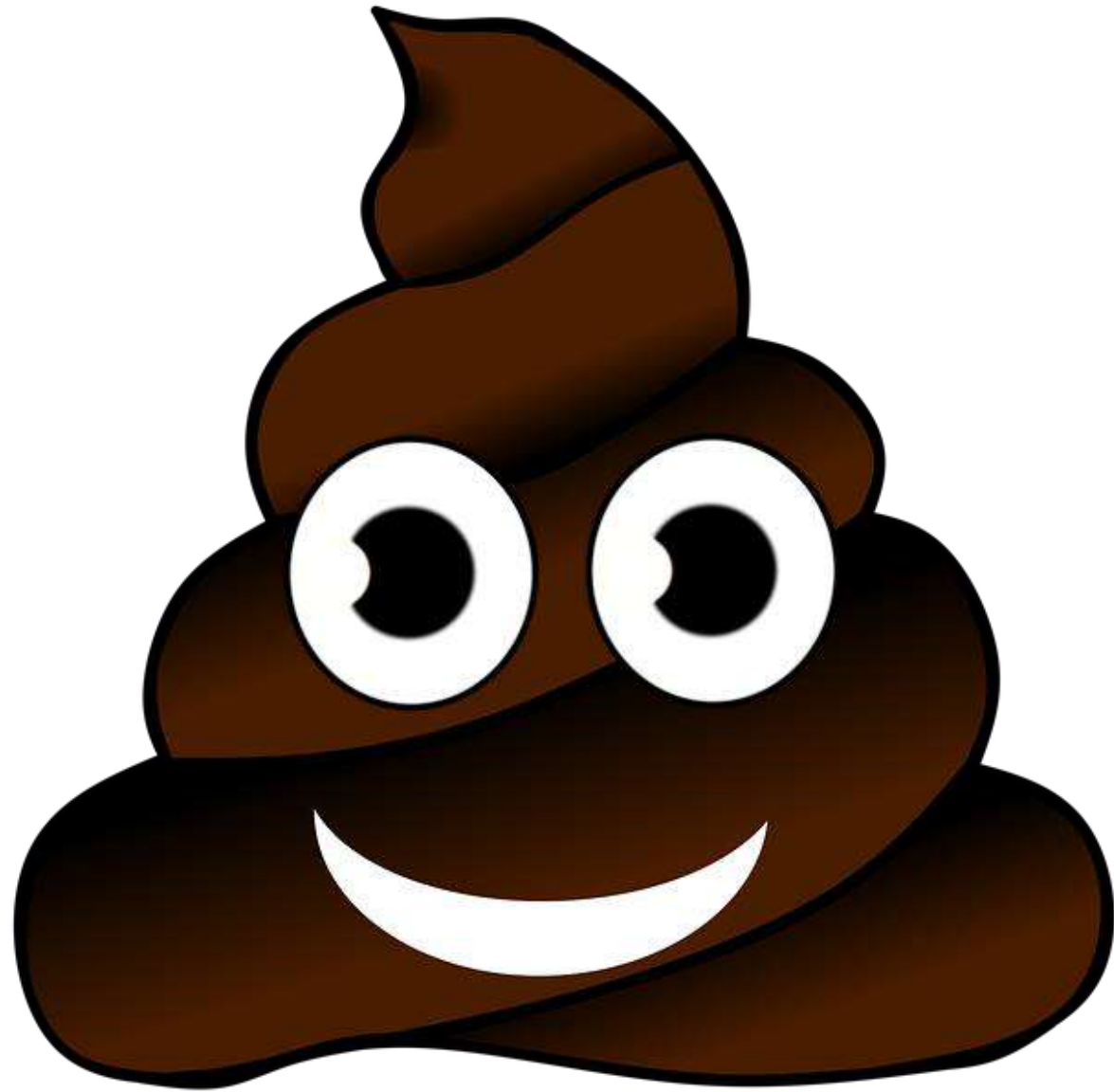
Annexes

Annex 1: Secondary school implementation - Introductory presentation

**WHAT DO YOU THINK WILL
CHANGE THE WORLD IN NEXT
50 YEARS?**







PICTURE CREDITS

- [All pictures are open license](#)
- <https://bit.ly/2SiwqK7>
- <https://bit.ly/2UP8pqY>
- <https://bit.ly/2Gf1svX>
- <https://bit.ly/2WS8ATZ>

Annex 2: Secondary school implementation - Presentation about bioeconomy

What is biomass and bioeconomy?

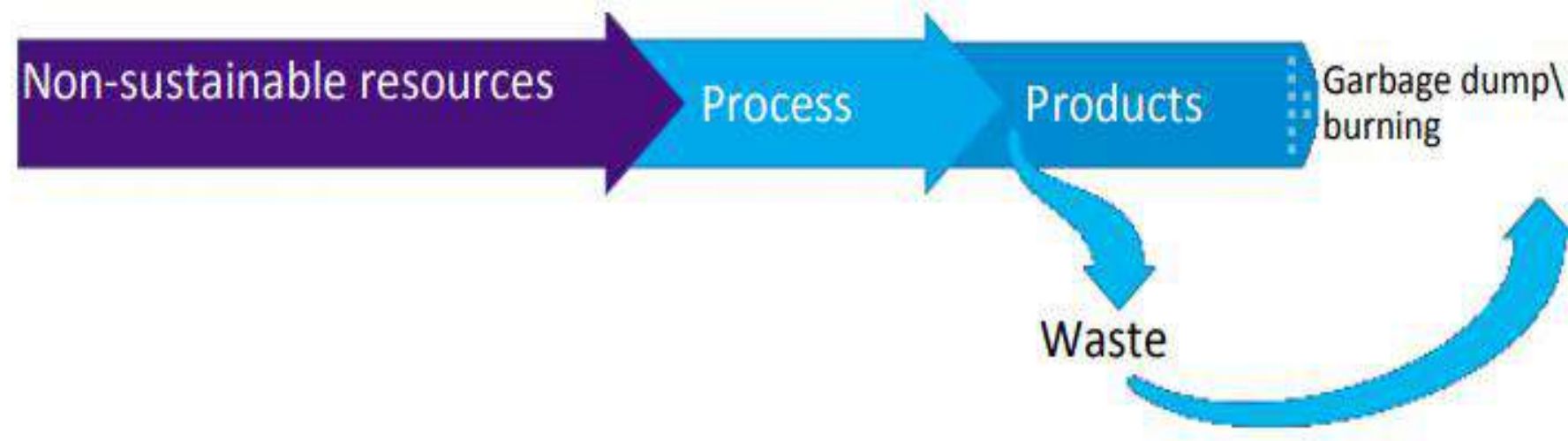


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Today....

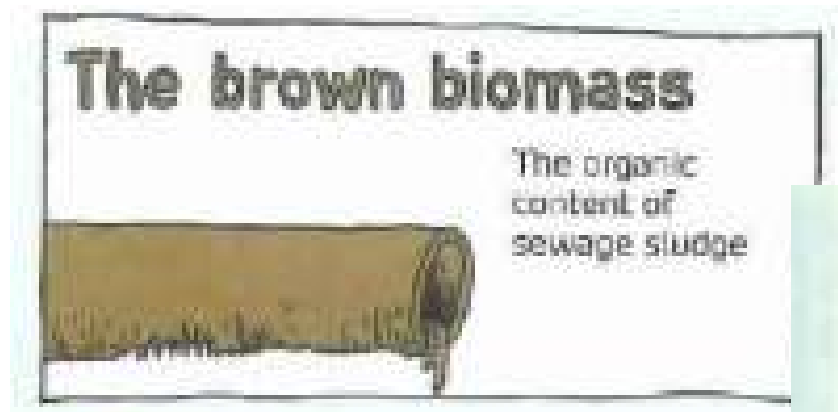
- ▶ We use fossil fuels as a most important resource
- ▶ Its not sustainable





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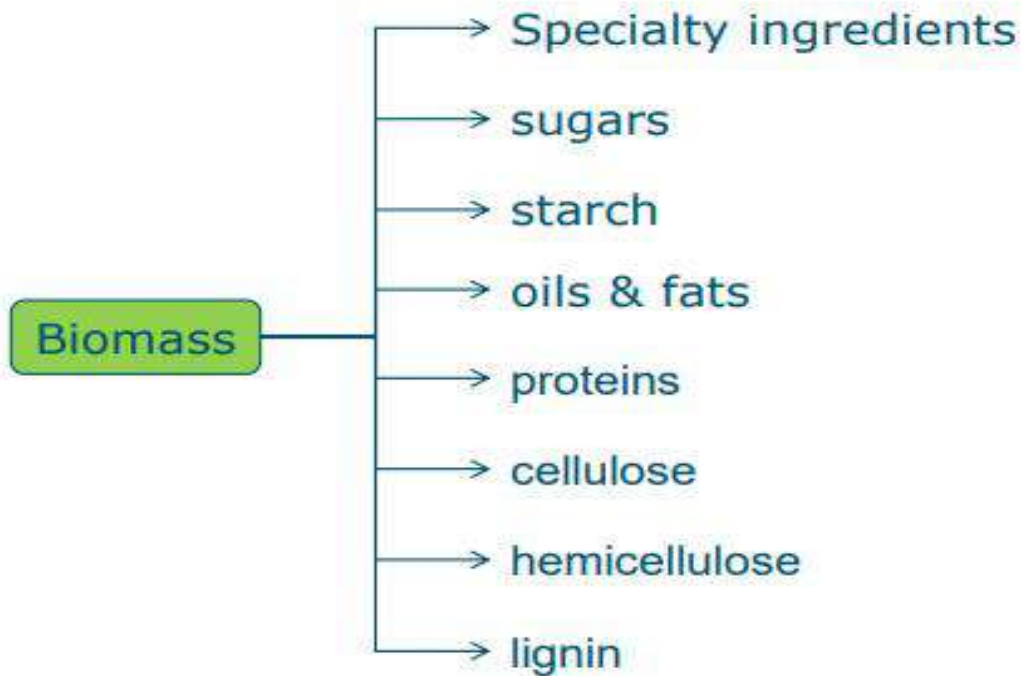
bloom

- ▶ The basis of Bioeconomy
- ▶ Crops, side streams wood, marine, etc

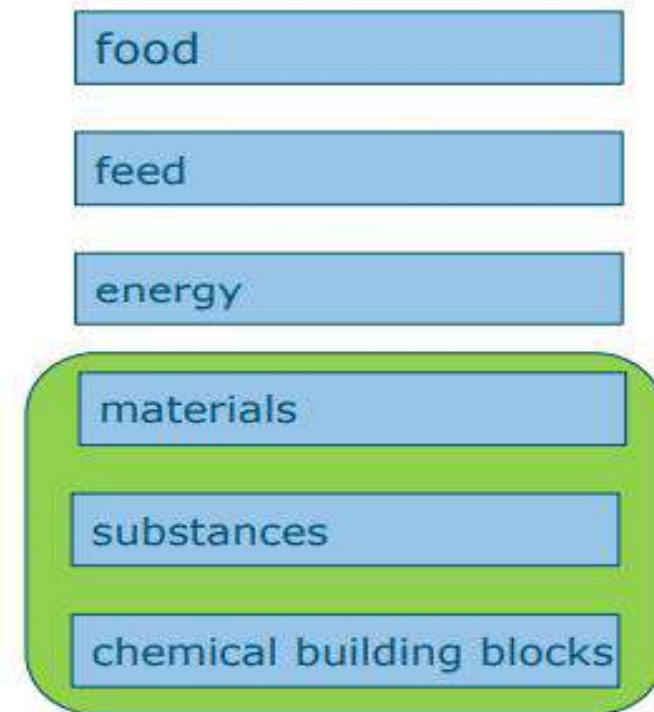


What can we do with biomass

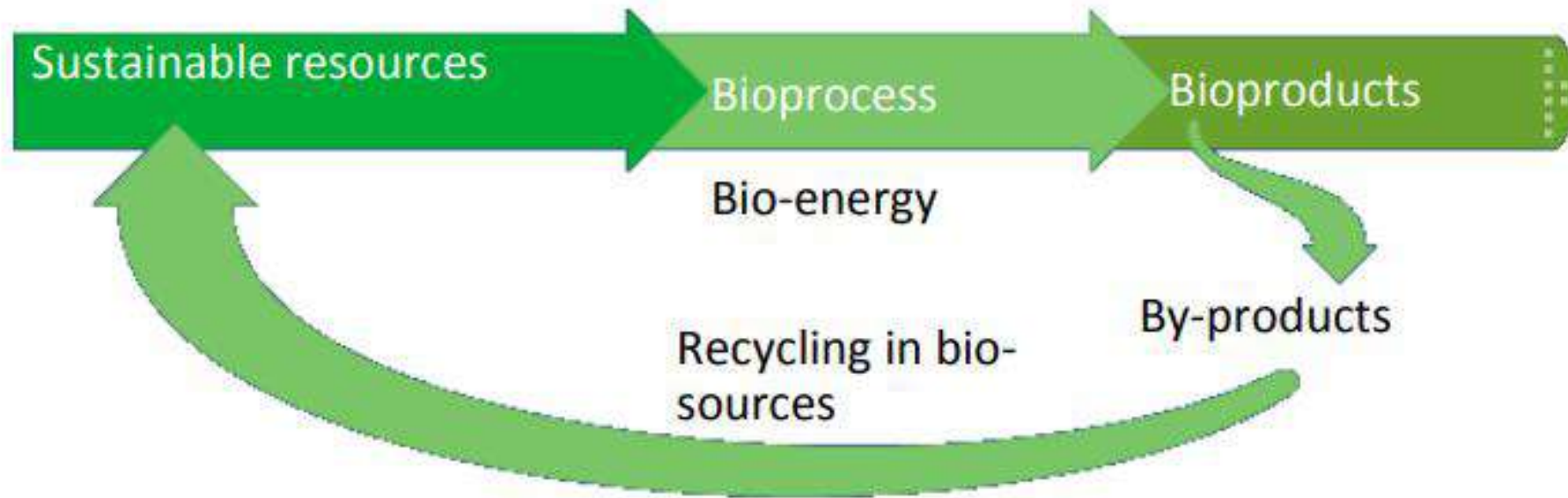
Composition:



Application:



Biobased Economy -



How to get energy from biomass?

Thermal conversion - burning biomass (wood, briquettes, ...)

Biofuel - fermenting biomass like sugar cane, wheat or corn

Different chemical process that produce methane



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Keywords

Biomass - organic matter used as a fuel, especially in a power station for the generation of electricity

Bioeconomy - Economy which is based on using biomass as a renewable resources for the production of materials and energy

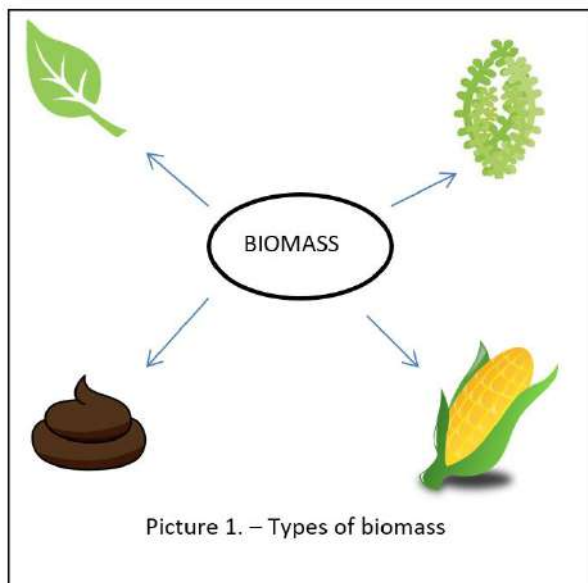
Annex 3: Secondary school implementation - Handouts

HANDOUT ABOUT BIOMASS

WHAT IS BIOMASS?

Biomass is organic material that comes from plants and animals, and it is a renewable source of energy. As an energy source, biomass can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of biofuel (eg methane). Crops such as corn and sugar cane are fermented to produce fuel for use in vehicles. Biodiesel, another transportation fuel, is produced from vegetable oils and animal fats.

TYPES OF BIOMASS



Biomass can come in many different forms. One of the most usual types of biomass is residues from crops or woods that is left after harvest. Another type of biomass we get from agricultural land such as corn or wheat and waste (poop) that animal and humans produce on daily basis. We can also use aquatic biomass from different type of seaweed to produce different materials and to produce energy depending on a need and composition of seaweed that we use.

Picture 1: Types of Biomass



Picture 2: Everyday products that are made from biomass

WHAT'S BAD ABOUT THEM?

Because we need a lot of biomass to produce energy and building materials we need a lot of space to produce biomass. That problem can lead to deforestation or using most of our agricultural fields for harvesting biomass for energy and not for food. If we wish to use biomass for building materials for different products we need to divide biomass to most simple components (proteins, fats, carbohydrates, etc.). That process can be expensive and it needs to be research more thoroughly.

HANDOUT ABOUT FOSSIL FUELS

WHAT ARE FOSSIL FUELS?

A fossil fuel is a fuel formed by natural processes, such as decomposition of buried dead organisms, containing energy originating in ancient photosynthesis. The age of the organisms and their resulting fossil fuels is typically millions of years, and sometimes exceeds 650 million years. The use of fossil fuels raises serious environmental concerns because burning fossil fuels produces carbon dioxide that is one of the biggest agent of greenhouse effect on our planet.

TYPES OF FOSSIL FUELS

There are three types of fossil fuels which can all be used for energy provision; coal, oil and natural gas. Coal is a solid fossil fuel formed over millions of years by decay of land vegetation. Coal is quite abundant compared to the other two fossil fuels. Oil is a liquid fossil fuel that is most widely used. It is applied in cars, jets, roads and roofs and many other. Natural gas is a gaseous fossil fuel that is versatile, abundant and relatively clean compared to coal and oil. Like oil, it is brought to the surface by drilling.

WHY DO WE USE IT?

Fossil fuels are cheap and reliable source of energy that we use on daily basis. Technology we need to harness the energy that is produced by fossil fuels is well developed and its used in every corner of the world. Anyone can use fossil fuels you just need a source of fire (a lighter or a match) and burn fossil fuels to release energy from it. Because technology we need to harness that energy is well developed, energy produced by fossil fuel is cheap in comparison with ones that are produced by renewable energy sources or biomass. Most of today's products contain plastics, which are produced from fossil fuels – oil. Because plastics and other materials that are produced with fossil fuels are widely used, fossil fuel industry employs millions of people globally. One of the main reason so many countries use fossil fuels as their main energy sources is that fossil fuels are everywhere.

WHAT'S BAD ABOUT THEM?

The main disadvantage of using fossil fuels, of course, is the pollution that they cause. Carbon dioxide is released when fossil fuels are burned and he is one of the biggest reasons for global warming. Because fossil fuels needed millions of years to get from living organisms to fuels they are finite energy source that can be and will soon be depleted. We are using fossil fuels everyday more and more and because of that we need to find more sources of fossil fuel which is harder by the day. Some of the fossil fuels may contain some materials that are harmful for human health. By burning those fossil fuels we release smog into air that is poisoning us and living world around us.



a)



b)



c)

Picture 1. – Types of fossil fuels: a) coal; b) crude oil; c) natural gas



Picture 2. – Everyday products that are made with of from fossil fuels

HANDOUT ABOUT RENEWABLE ENERGY

WHAT IS RENEWABLE ENERGY?

Renewable energy is energy that is collected from renewable resources, which are naturally replenished on a human timescale. Renewable energy resources exist over wide geographical areas, in contrast to other energy sources, which are concentrated in a limited number of countries. Most of renewable energy sources produce electricity that can be converted into heat or mechanical energy with high efficiency depending on the necessity.

TYPES OF RENEWABLE ENERGY

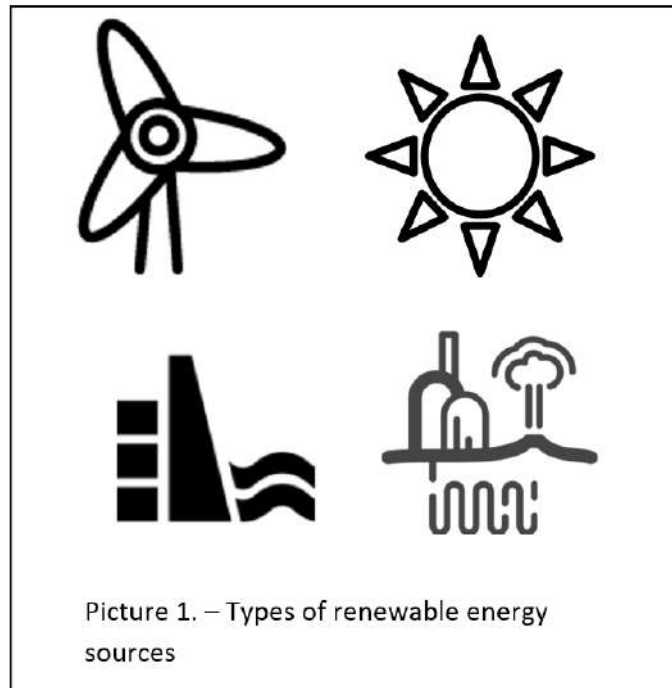
There are many forms of renewable energy such as sunlight, wind, tides, waves, and geothermal heat. Solar energy is the direct conversion of sunlight using panels or collectors. Wind energy can be used to produce electricity using large windmills. We can use tides and waves to harvest energy of the sea or rivers by building dams. Geothermal energy is based on using heat below Earth's surface for heating diverse heating purposes.

WHY DO WE USE IT?

Because we have less and less fossil fuels their price will go up eventually. That's the main reason we need to find another source of energy that will replace them. Because Sun will always rise and wind will always blow the reliability of renewable energy types can far exceed that of fossil fuels. Almost all of the renewable energy plans have lower carbon dioxide emission than those plan that include fossil fuels. That means renewable energy sources impact less on greenhouse effect. Once in place, most of renewable energy power plants have lower cost of operation than that of fossil fuels. We just need to change materials regularly and we will get electricity. Because of that there are a lot of job options in renewable energy sources. One of the main advantages is that anyone can place one of renewable energy generators in their home. We can place solar panels on our roof, or small windmill in our back yard.

WHAT'S BAD ABOUT THEM?

Because renewable energy is a new field more research is needed so we need to invest a lot of money in renewable energy to make it more efficient. Although we use renewable sources to make energy (e.g. Sun, wind, rivers) they can only produce so much energy in a given time. Because of that we need large area to set up large farms of energy to produce enough energy for towns. With that said we impact nature in another way. We need to clear forests and change river flows so we can use renewable energy sources properly.



Picture 1 - Types of renewable energy sources



Picture 2. – Example of renewable energy farm

Useful notes about practical work

1) Fossil fuels

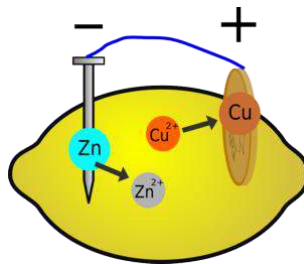
If you have you can use model of diesel engine as a example of turning fossil fuels into energy.

2) Renewable energy

You can use model of solar power plant or any toy that runs on solar power. Most of today calculators run on solar power so you can use that as an example of turning renewable energy into electricity. One of the best examples is hydro power plant. If you have one in your country you can use it as example.

3) Biomass as energy

You can use lemon to produce enough electricity to power LED light. Squeeze lemon and put few (3 or more) copper wires in it and few (3 or more) nails (preferable zinc nails) in it. Copper acts as a anode and zinc nail acts as a cathode of your battery that is lemon now.

**HANDOUT: HOW TO MAKE BROCHURES?**

You will need Office Word program 2013 or later on every device your students will be using.

After that go to: <http://templatelab.com/brochure-templates/>

From that web page chose any brochures template you like and save it as a Word file. You can edit it inside Word using your own pictures and text. After you edit it save it as a PDF file and print it if you want.

Annex 4: Primary school adaptation – introductory presentation

ENERGY



bloom



Future
Classroom Lab
by European Schoolnet

MECHANICAL
ENERGY

CHEMICAL
ENERGY

NUCLEAR
ENERGY

ENERGY

THERMAL
ENERGY

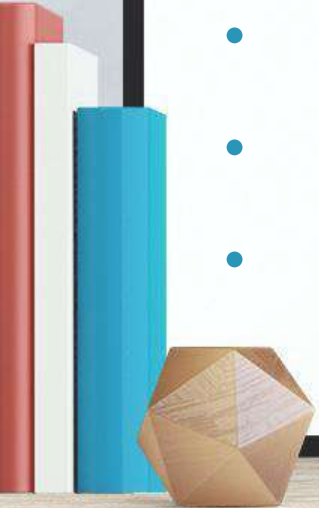
ELECTRICAL
ENERGY

LIGHT ENERGY



All living things need energy to live. Machines and tools use energy to work.

- All living things need energy from the Sun and food to live.
- Tools use energy from people or animals to work.
- Many machines use energy from electricity to work.
- Most means of transport use energy from burning fuel to move.



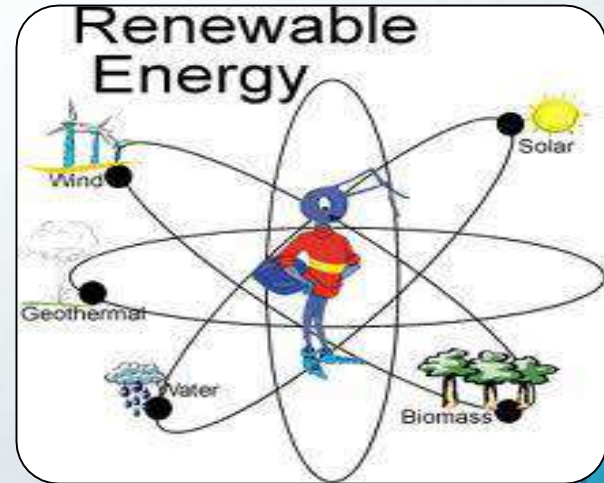
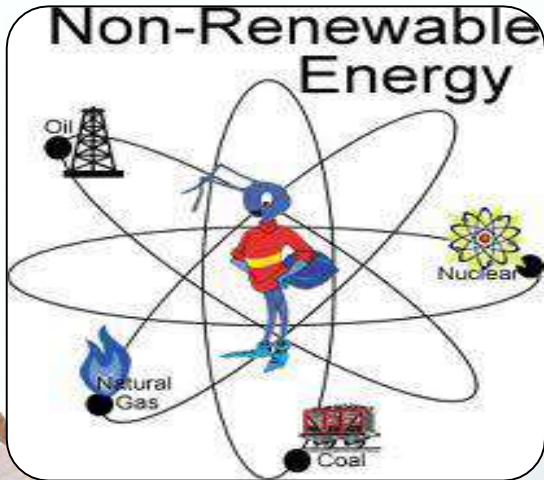
What happens to energy when it's used?

- Energy never disappears. It can be transformed from one type of energy into another, but it doesn't disappear completely.
- For example, energy can be stored inside batteries as chemical energy. When the batteries are put inside a torch, the torch transforms the chemical energy into light energy.



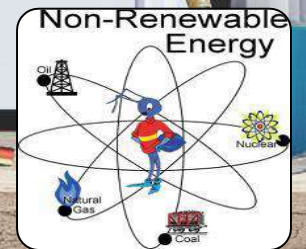
MAIN SOURCES OF ENERGY

- NON – RENEWABLE ENERGY SOURCES
 - RENEWABLE ENERGY SOURCES



NON-RENEWABLE ENERGY SOURCES

- Non-renewable energy is energy from sources that are limited. If they are consumed faster than they are made, they will run out.
- These are fossil fuels: coal, petroleum, natural gas and uranium.
- They are found under the ground.
- They were made millions of years ago and millions of years are necessary to make more.



They are found
under the ground.

They will run
out

NON-RENEWABLE
ENERGIES

They were made
million of years
ago.

COAL, PETROLEUM
(OIL), NATURAL GAS
AND URANIUM



COAL



- COAL is a solid. It is a black rock composed mainly of carbon. It is formed underground and extracted through mines.
- Coal is transported by train and boat.
- Coal is used mainly in power stations to make electricity and as fuel in some industries.



PETROLEUM (OIL)

- PETROLEUM is a black liquid. It is formed underground and extracted through wells.
- Petroleum is transported to refineries by tanker and pipeline.
- It is the source of the **fuel oil, diesel fuel and petrol** that we use for heating and running vehicles
- Petroleum is used in industries , homes and vehicles.



NATURAL GAS

- NATURAL GAS is a mixture of gases. It is found underground and extracted through wells.
- Natural gas is transported by pipeline.
- Natural gas is used in homes for heating and cooking, and in industries.



URANIUM

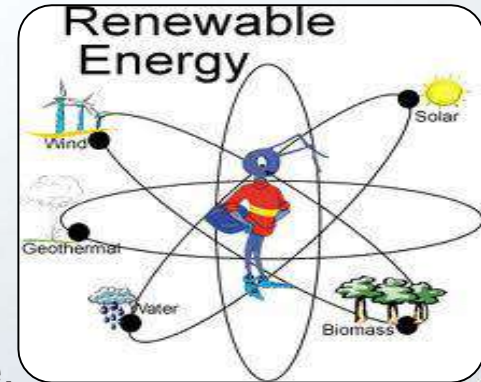
- It is a radioactive metal found in rocks.
- It is used in nuclear power stations to produce heat in nuclear reactions.
- Electricity is produced from **this** heat.



RENEWABLE ENERGY SOURCES

These are

- Hydroelectric energy (from water),
- Wind energy,
- Solar energy ,
- Geothermal,
- Biofuels .
- These energy sources are always available.
- They will never run out.



RENEWABLE ENERGIES

```
graph TD; A[RENEWABLE ENERGIES] --- B[They will NEVER run out]; A --- C[They are always available.]; A --- D[WIND, WATER, SUN, GEOTHERMAL, BIOFUELS]
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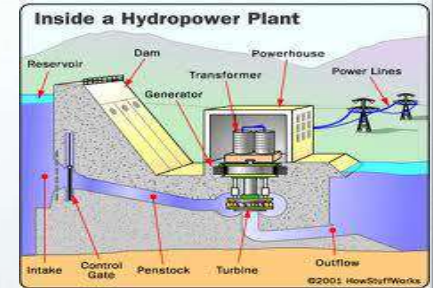
They will NEVER run
out

They are always
available.

WIND, WATER, SUN,
GEOTHERMAL,
BIOFUELS

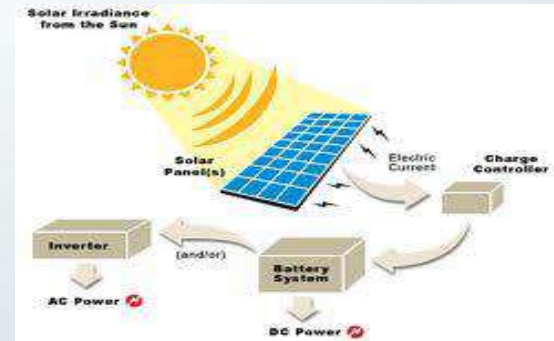
HYDROelectric ENERGY

- We get this energy from water that is moving or falling (from a dam).
- The water is collected in a reservoir. Then it passes through a turbine. As the turbine turns, it generates electricity.
- Hydro energy is transformed into electricity.



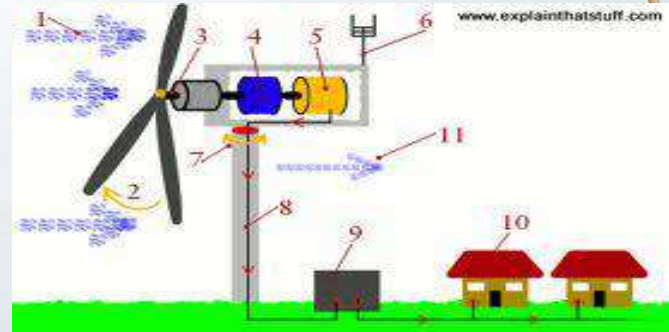
SOLAR ENERGY

- Solar panels receive energy from the Sun.
- Solar energy is transformed into electricity that is used for light or heat.



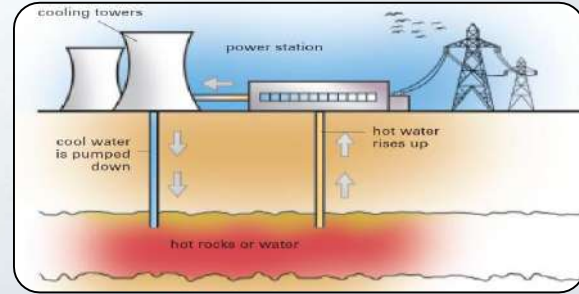
WIND ENERGY

- We get wind energy from the movement of the air.
- The kinetic energy of the wind turns a turbine and produces electrical energy.
- Wind energy is transformed into electricity.



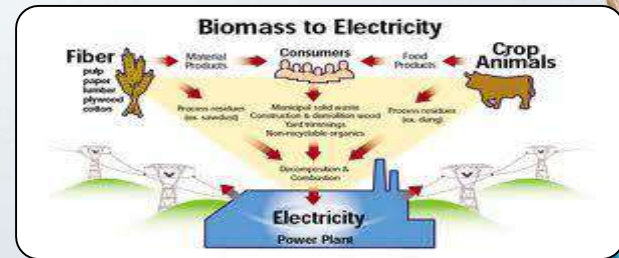
GEOHERMAL ENERGY

- Geothermal energy is the heat from the Earth.
- It's clean and sustainable.
- Geothermal energy is the heat from the Earth. It's clean and sustainable.




Biofuels

- We get biofuels from plant and animal products.
- Biofuels can be solid (**biomass**), liquid (**bioliquids**) or gas (**biogases**).
- This energy is transformed into electricity and heat.





 Biomass is a renewable energy source that can be used to generate electricity, heat, and transportation fuels. It is made from organic materials such as crops, wood, and animal waste.

Towards a biobased society

- + **The population on Earth is growing** and we need more food. Climate change is both a reality and a threat. The answer is simple: We absolutely must use our biological resources better, so there will be food for more people with less environmental and climate impact per unit produced, and renewable biological material enough to produce the replacement for what we currently get from fossil crude oil (e.g. materials, chemicals and plastics).



Poop is Power



WOULD YOU EVER CONSIDER USING YOUR POOP AS FUEL?



SUBSCRIBE

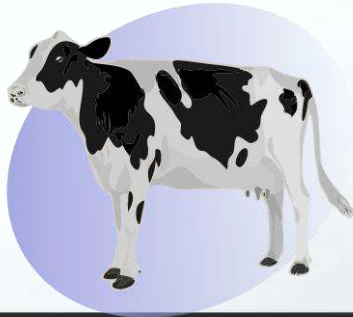


3:08 / 3:43



Biomass Energy

- + Did you know that poop can make power? It's true.
- + Gas rising from the poop of 500 cows can create enough electricity to power 100 homes.
- + That's some powerful poop!

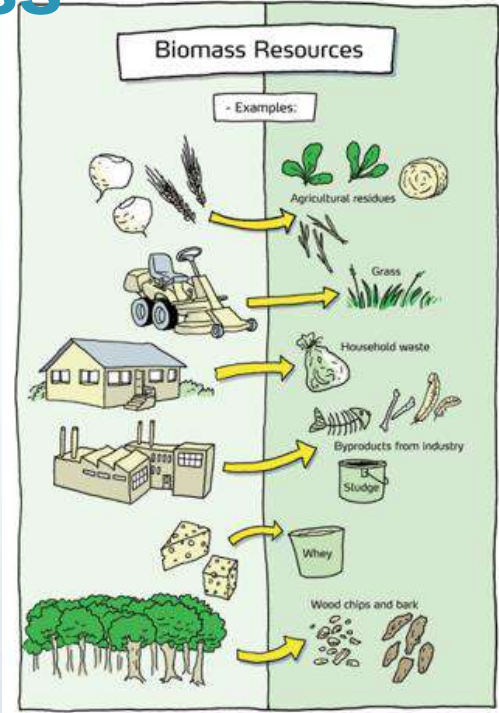


SIMPLE
energy



Poop is a form of biomass

- + Poop is a form of “biomass” which is the name for all living, or recently living materials coming from plants and animals that are a source of energy.



Poop is a form of biomass

- + The most common form of biomass energy on Earth is burning wood. We burn wood in fireplaces to keep us warm, or in woodstoves to cook our food.



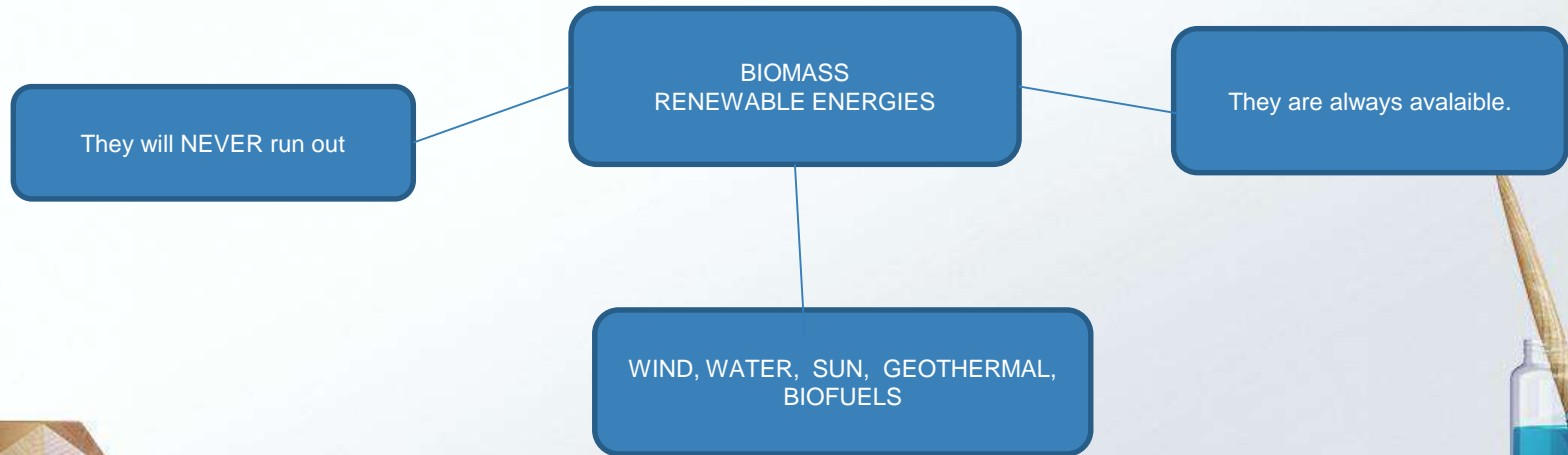
Poop is a form of biomass

- + Besides wood and poop, biomass fuels can come from stalks of wheat, corn or sugar cane. It can also come from rice hulls, cooking oil, and other forms of garbage and food waste.



Biomass vs. Fossil Fuels

- + Biomass materials can be grown over and over again, so they are considered renewable resources.



Biomass vs. Fossil Fuels

- + It takes them only months or years to grow and become fuel, unlike fossil fuels that take millions of years to become coal, oil, or gas.

COAL

OIL

GAS

1.000.000 years

Biomass

Months or years

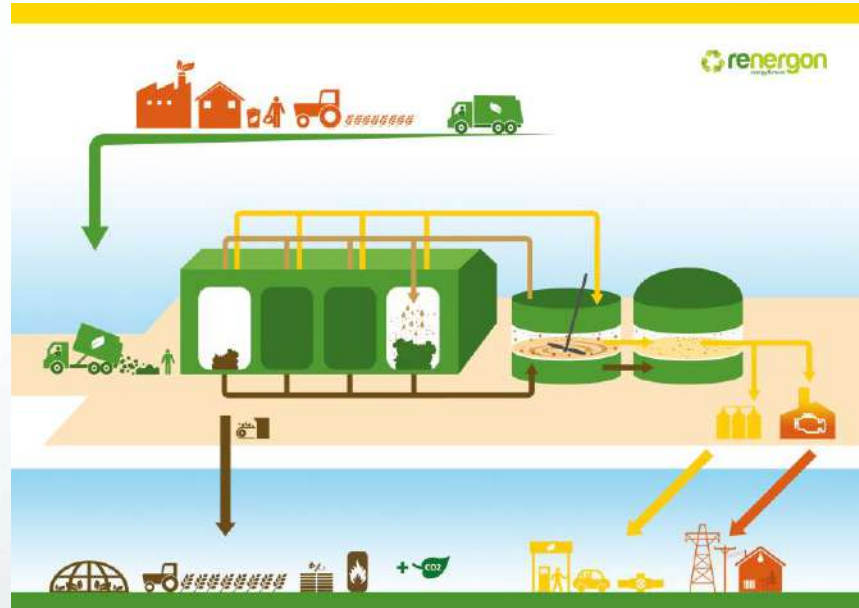


How does this happen?



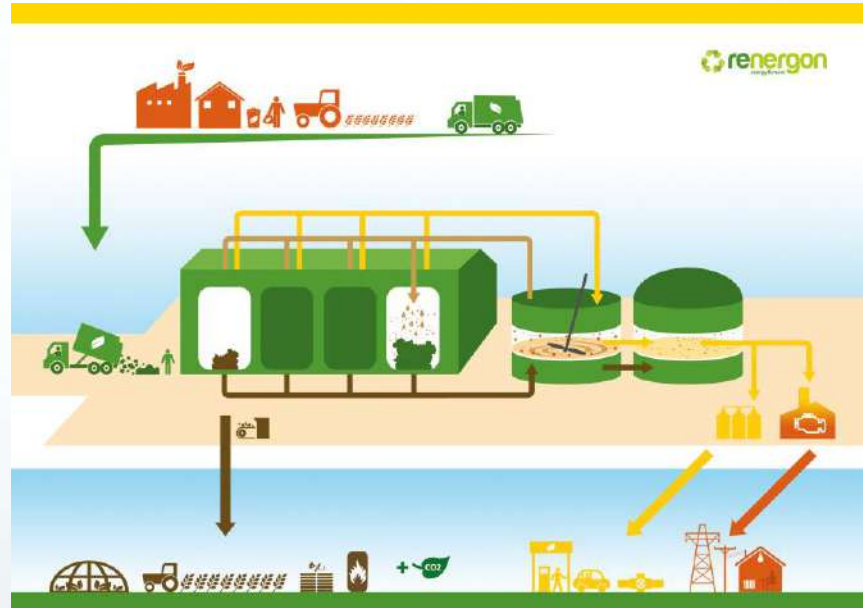
Biomass and Biogas

- + Biogas energy is created from burning the gas that comes off animal poop and rotting plants.



Biomass and Biogas

Rating stuff gives off methane and carbon dioxide gases. When burned in an airtight container, these gases are collected in a process called gasification, and are used to produce energy.



Biomass and Biogas

- + Biogas energy is used to heat water to create steam, which turns turbines, which generates electricity. The plant and animal waste that is left over is used as fertilizer for plants.



Keep Those Biomass Fires Burning

The best reasons for using biomass and biogas fuels are that they are sustainable; as long as people replant the fuel crops they harvest to create them.



Keep Those Biomass Fires Burning

- + Also, plant and animal remains that were once considered waste and thrown in landfills are now being put to use as energy.
- + The problem with biomass energy is that burning wood and garbage can still create air pollutants.



Keep Those Biomass Fires Burning

- + Also, plant and animal remains that were once considered waste and thrown in landfills are now being put to use as energy.



Keep Those Biomass Fires Burning

- + Humans have used biomass energy for thousands of years. Today, nearly one third of the planet still uses some form of biomass energy, proving it remains a long-lasting, inexpensive alternative energy choice.



Any problem?

- + The problem with biomass energy is that burning wood and garbage can still create air pollutants.



WHAT PROBLEMS DO NON-RENEWABLE ENERGY SOURCES CAUSE?

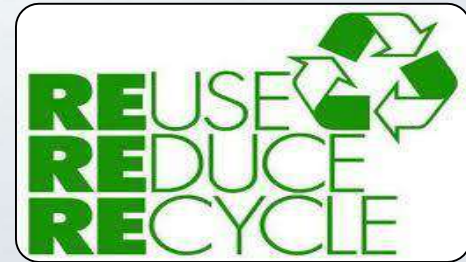
- + Using non-renewable energy sources causes two problems.
 - 1) These sources are limited. They can run out.
 - 2) These sources produce pollution such as *carbon dioxide and other gases* that are harmful for people and the environment.
- Pollution is causing global warming and acid rain on our planet.
- *Gases from industries and vehicles goes up to the atmosphere and sometimes are condensed in clouds and when it rains it causes pollution. (sulfur dioxide and nitrogen oxides)*



SAVING ENERGY

- Our lifestyle influences the amount of energy.
- We can save energy by making less waste.
- We must follow the 3 Rs:

+

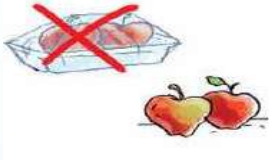


1ST R : REDUCE

+ It means BUYING LESS so that throw away less.



Repair things when they break.



Avoid packaging



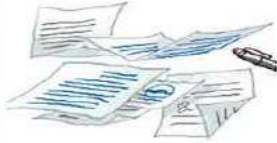
Don't use disposable items.



Buy large packs when possible.

2nd R: REUSE

+ It means USING THINGS AGAIN instead of throwing them away.



Use paper on both sides

Make a pencil
pot from a
metal can



Take water to school in
a reusable bottle.



Give your old toys away.



3rd R: RECYCLE

- It means separating rubbish (or waste) and putting it in the correct bin.
- Recycling materials uses much less energy than making new ones.

Paper and cardboard



Glass

Metal and plastic



Thank you for your attention



bloom



Annex 5: Primary school adaptation – Vocabulary activity

ABOUT ENERGY

Session 1. Activity 3. Practice

1. Correct the false sentences and change the word underlined.

- a) We can reduce pollution to protect our planet.
- b) The four “Rs” are: reduce, reuse, recycle.
- c) The non-renewable sources never run out.

2. Draw some objects that can be reduced, reused and recycled.

REDUCE

REUSE

RECYCLE

3. Fill in the missing verbs. Choose the correct option.

- a) We can _____ energy to protect our planet. (save/waste)
- b) A lot of the energy we _____ at home is non-renewable. (use/protect)
- c) The three Rs _____ the environment. (damage/protect)
- d) We can save energy if we _____ off lights. (turn/take)

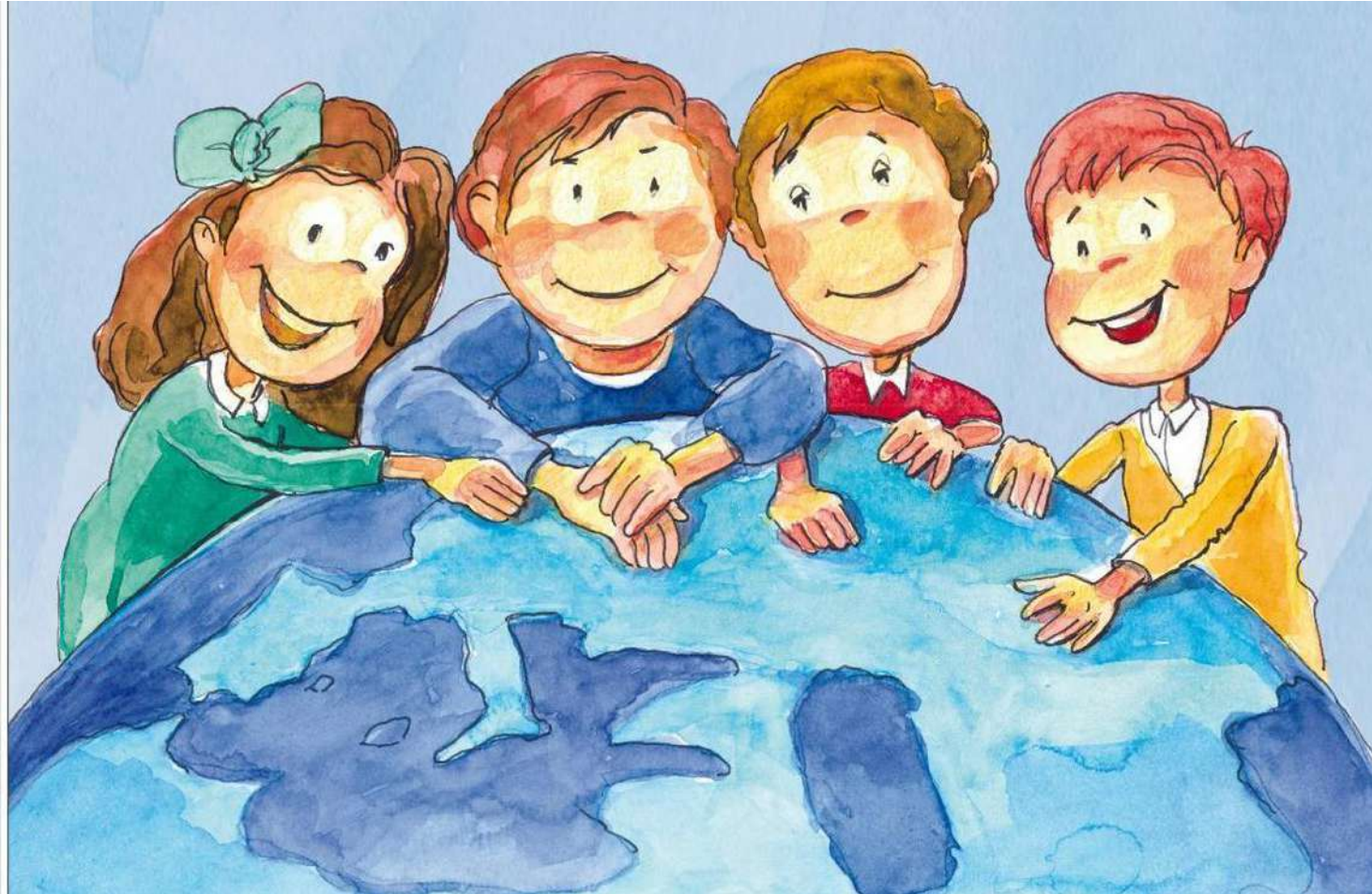
Annex 6: Primary school adaptation – group work presentation

Did you know that
each one of us
generates more
than a kilo of
waste per day?



Treasures in the trash...

Urban hygiene, recycling and environment

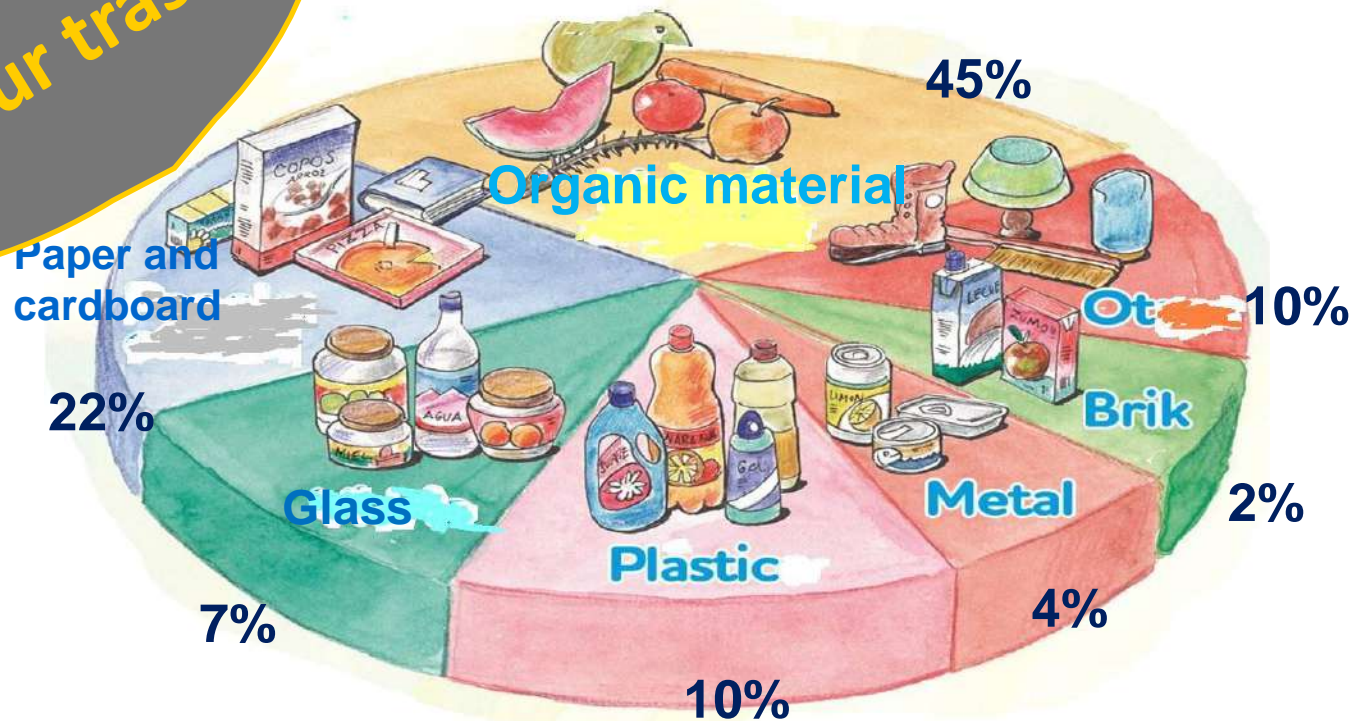




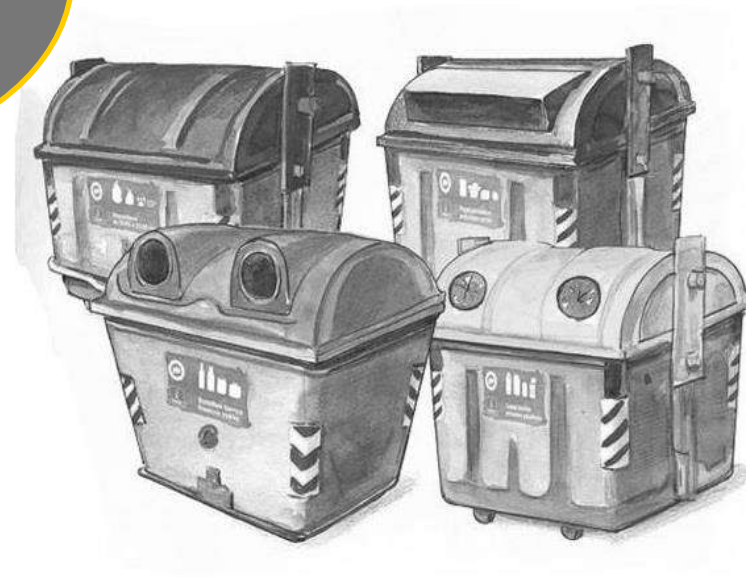
Did you know that
each one of us
generates more
than a kilo of
waste per day?

And that the majority of this waste can be used?

A treasure
in your trash



**The three-
Rs Rule**



**Reduce
Reuse
Recycle**

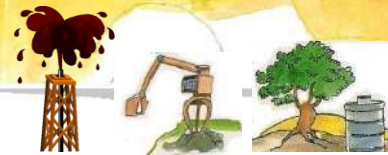
For recycling you must learn to separate



Trees



Silica sand



Oil, trees, bauxite and iron

There is a urban waste treatment centre



WASTE TREATMENT PLANT



Grey bin

Yellow bin

Rubbish that we can not recycle



What can we do with the rubbish that we can not recycle?



GREY BIN

**ORGANIC
MATERIAL**



**COMPOSTING
PLANT**
To make compost

**THE REST GOES
TO**



CONTROLLED DEPOSIT



COMPOSTING PLANT

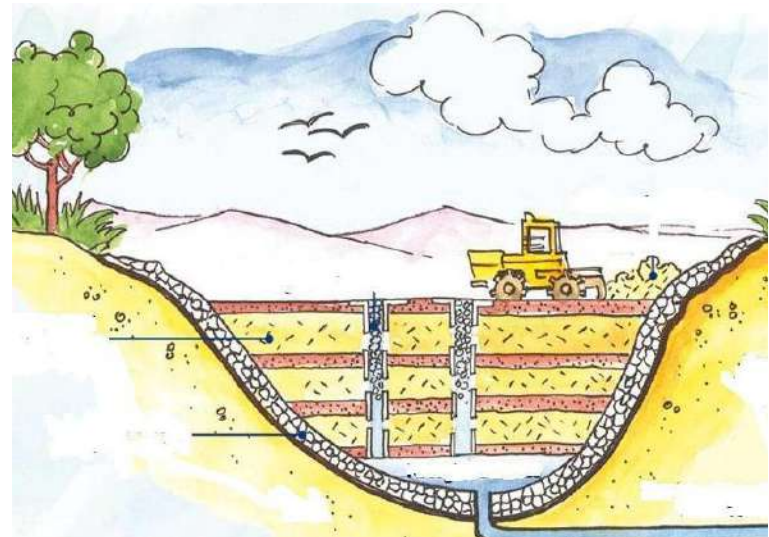


We use organic rubbish to make compost.

**SLUDGE
DRYING
PLANT**

First we dry the compost





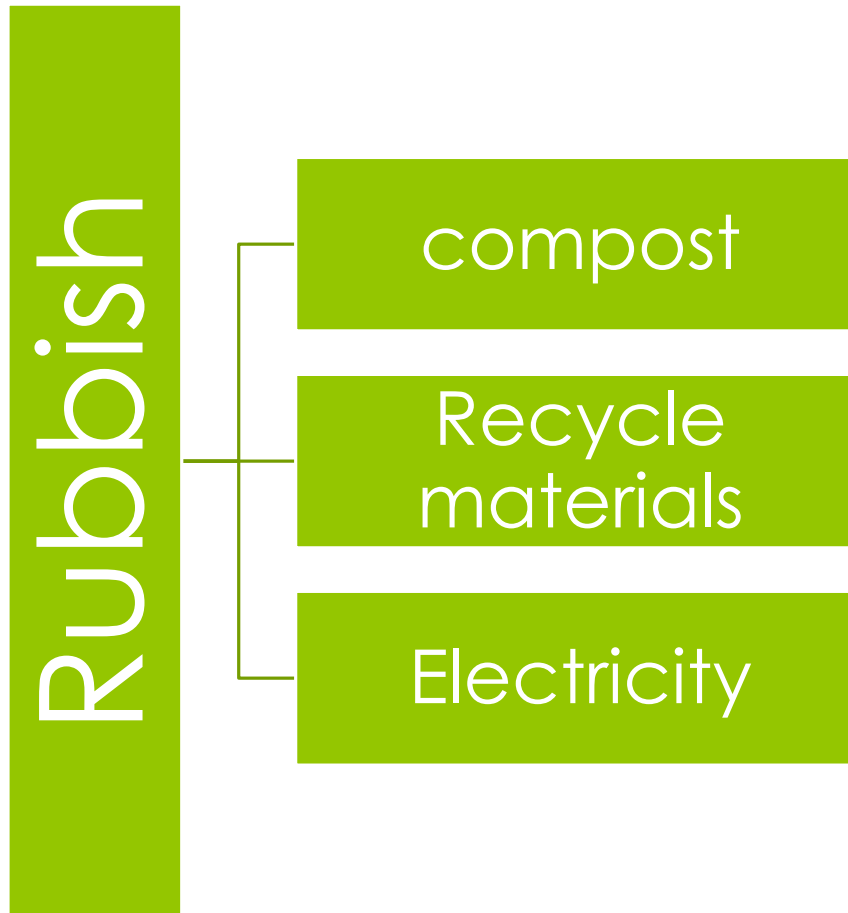
They make mountains!



**BIOGAS
PLANT**

**The rubbish, that is
buried in the
controlled deposit,
will decompose into
a gas called BIOGAS
and they use to make
electricity!**

**In the rubbish we can find treasures
such as:**



And finally they create a green area...





**Thank you for
your
attention**

THE CYCLE OF POOP



LET'S BEGIN THE JOURNEY...

- o YOUR POO SLIDES DOWN A PIPE INTO A SEWER (UNDERGROUND TUNNEL)
- o WATER THEN WASHES IT AWAY TO A SEWAGE PLANT.



o IN THE SEWER, YOUR POO MIXES WITH WATER AND OTHER POO TO MAKE A THICK, BROWN UNDERGROUND RIVER.





◊ FLUSHING THE TOILET WASHES POO THROUGH THE PIPES TO THE SEWER, AND THE SEWER TAKES THE POO TO A SEWAGE TREATMENT PLANT.

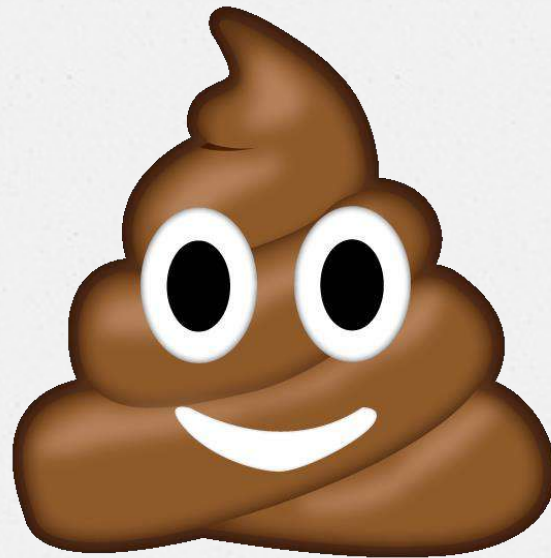


- THE DIRTY WATER IS SPRAYED ON TO STONES WICH HAVE GOOD BACTERIA. THE GOOD BACTERIA KILLS THE BAD BACTERIA (POO)
- WHEN THE GOOD BACTERIA DIE THEY ARE FLASHED TO THE SEDIMENTATION TANK AND THEN GOES TO THE RIVER



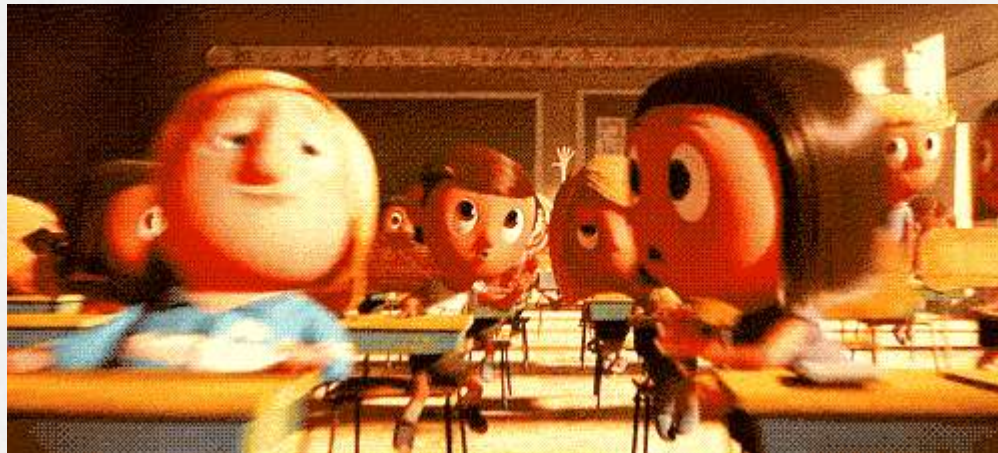
🔴 But what can we do to take advantage of the poop?

🔴 Can poop be a treasure too?



Let's investigate

It is your turn!



Useful links

- o http://www.poopower.com.au/uploads/files/poo_power_study_guide_v1.lowres.pdf
- o <https://energy.economictimes.indiatimes.com/news/power/chicken-poop-can-be-used-to-generate-electricity-study/61722818>
- o <http://www.ecology.com/2011/10/10/poop-power-biomass-energy/>
- o <http://www.funkidslive.com/learn/energy-sources/biomass-energy-source-fact-file-2/>

Annex 7: Learning Design: Secondary School Implementation

Description	
Context	<p>Topic: Energy/bioeconomy</p> <p>Total learning time: 90 minutes</p> <p>Number of students: 18 students</p> <p>Description: In this workshop, students will learn about bioeconomy, and how it can impact on everyday life. Through discussion, practical work and the creation of a web brochure, all learners will learn about positive and negative facts about biomass, fossil fuel and renewable energy sources.</p>
Aims	<ul style="list-style-type: none"> • implementation of the term bioeconomy in everyday life • compare energy producing from fossil fuels, biomass and renewable energy sources • importance of using biomass as a resource of producing energy • find new eco-friendly ways of energy production • design web brochure
Outcomes	<p>Define (Knowledge): All learners will learn about term bioeconomy and how it can impact on everyday life. All learners will learn about biomass, fossil fuel and renewable energy sources</p> <p>Find out/discover (Knowledge): All learners will discover, through practical work and worksheets, positive and negative facts about biomass, fossil fuel and renewable energy sources</p> <p>Design (Synthesis): Most learners will learn how to write a web brochure in pdf format</p> <p>Summarise (Synthesis): Some students will present a web brochure about biomass, fossil fuel and renewable energy sources</p> <p>Play (Psychomotor skills): all learners will play a quiz about energy/bioeconomy.</p>
Teaching-Learning activities	
Discuss about energy, the ways of producing energy right now. Discuss about bioeconomy, producing energy in the future (include human waste and animal poop), and how much people know about bioeconomy.	<p>Discuss 5 minutes 18 students Tutor is available</p> <p>Start the presentation and ask the following questions. What do you think will change the world in next 10 years? What is our future in producing energy! After that, state that you think human waste (poop) will change the world.</p>
	<p>Read Watch Listen 2 minutes 18 students Tutor is not available</p> <p>Now you will watch a video showing how much people know about bioeconomy.</p>
	<p>Discuss 2 minutes 18 students Tutor is available</p> <p>Discuss the content of the video. Do people know enough about bioeconomy? Why do you think that is? What does it depend on? In the discussion every student can state his opinion. Students are encouraged to create their own videos which represent knowledge of bioeconomy in their country.</p>

<p>Lecture - about bioeconomy and biomass.</p> <p>Show the ways of gaining energy from biomass (PPT).</p> <p>Explain positive and negative facts about producing energy from biomass.</p>	<p>Read Watch Listen 15 minutes Tutor is available</p> <ul style="list-style-type: none"> Define facts about bioeconomy. Define what is biomass and what it can be used for, also define different type of biomass. Explain how to get energy from biomass. Show positive and negative facts about producing energy from biomass. Explain how to get new products from human waste and animal poop. <p>Before this workshop, you can make your own power point presentation.</p>
<p>Exercise - Fossil fuels vs Biomass vs Renewable energy sources</p>	<p>Investigate 20 minutes 18 students Tutor is not available</p> <p>Divide pupils in 3 groups (group size depends on the number of students). Each group is given a topic: fossil fuels as energy/biomass as energy/renewable energy sources.</p> <p>Each group is provided with materials for their research and a laptop for internet search.</p>
	<p>Practice 10 minutes 18 students Tutor is not available</p> <p>*OPTIONAL!!!!*</p> <p>After carrying out their research, each group will carry out practical work, which is explained in their materials.</p>
	<p>Produce 20 minutes Tutor is not available</p> <p>Students will work on designing a brochure to highlight the pros and cons for each type every energy resource.</p>
	<p>Discuss 6 minutes 3 students Tutor is not available</p> <p>One student from each group will present the results of their investigation included in their brochure.</p> <p>They will conclude that biomass and renewable energy sources, which are new eco-friendly ways of energy production, are better than fossil fuels.</p>
<p>Conclusion: Quiz about energy/bioeconomy</p>	<p>Practice 10 minutes 18 students Tutor is available</p> <p>As a conclusion, students will take a Kahoot quiz about everything they have learned during the lesson.</p>

Annex 8: Learning Design: Primary Adaptation

Description	
Context	<p>Topic: Science/ Energy/ Biomass</p> <p>Total learning time: 120 minutes</p> <p>Number of students: 24</p> <p>Description: In this workshop, students will learn about bioeconomy, and how it can impact on everyday life. Through discussion, practical work and the creation of a web brochure, all learners will learn about positive and negative facts about biomass, fossil fuel and renewable energy sources.</p>
Aims	<ul style="list-style-type: none"> • Implementation of the term bioeconomy in everyday life • Compare producing energy from fossil fuels, biomass and renewable energy sources • Understand the importance of using biomass as a resource of producing energy • Find new eco-friendly ways of energy production • Design web brochure
Outcomes	<p>Comprehension (Comprehension): Learners</p> <p>Students will learn about term bioeconomy and the implementation of this term in everyday life. All learners will learn about biomass, fossil fuels and renewable energy sources.</p> <p>Application (Application): Find out/discover</p> <p>All learners will discover, through practical work and worksheets, positive and negative facts about biomass, fossil fuels and renewable energy sources.</p> <p>Analysis (Analysis): Design</p> <p>Most learners will learn how to classify renewable sources and they will set conclusion about their everyday life</p> <p>Evaluation (Evaluation):</p> <p>Students will present an advertisement encouraging citizens to use energy in a responsible way and presenting how we can change the world if we use biomass, bio-fuel and renewable energy sources. They will also take a quiz on the topic of energy/bioeconomy.</p>
Teaching-Learning activities	
<p>Session 1</p> <p>Brainstorming.</p> <p>What do you know about energy and other concepts as: biomass and renewable resources?</p>	<p>Discuss 10 minutes 24 students Tutor is available</p> <p>To introduce the topic, we will start the lesson with a brainstorming mind map. With the help of the teacher, students will elicit the information that they already have about the topic. Their answer could be: different types of energy, renewable energy, reduce, reuse recycle.</p>
	<p>Read Watch Listen 40 minutes 24 students Tutor is available</p> <p>Introduction of the new vocabulary: First, kids will watch a short video about the consequences of energy waste, to make them reflect on the issue. Once we have elicited what students already know about energy, we will introduce to our students the contents</p>

	of the topic. "Energy and other unusual Source Of Power..." Students will watch a video about the contents.
	Collaborate 10 minutes 24 students Tutor is available Once the kids have learnt about the contents of the topics, we will practice with a worksheet. They will work in groups of 4 and discuss the answers of activities in the worksheet. When they finish, they will have to explain their answers.
	** DIVERSITY ** Our students with learning difficulties will take part in every activity with specific adaptations, depending on their difficulties. Some of these adaptations will be: having a classmate as a tutor, lots of visual support, do the activities orally instead of in writing, with lots of short and clear instructions. They will also have more time to finish the activities. To solve any difficult situation, our kids will be in groups of four in heterogeneous groups, where they will help each other to do the tasks.
Session 2	Read Watch Listen 30 minutes 24 students Tutor is available We will revise the contents of the previous day and we will start with the question: How can poop change the world? How can trash can change the world? We will explain how we really can find treasures in the trash... We will remember that the first thing we can do is to use the three "Rs": reduce, reuse, recycle. After that, we will present a power point about how to take advantage of the trash in our city. We will also watch a video about how waste is turned into compost and electricity. The video is in Spanish, but we can turn the volume off to see the images and the teacher will explain the process.
	Investigate 30 minutes 24 students Tutor is available The teacher will present to the students the cycle of poop and after the teacher will ask them a question: Can poop be a treasure too? In groups, students will try to answer the question and they will sum up the information they learnt. After this, students can look for new information on different websites indicated in the power point to prepare their final task: an advertisement promoting good actions to protect the environment (a video). They will make their own presentations about the different advice that they can give to citizens to look after the environment.
Session 3	Produce 40 minutes 24 students Tutor is available Evaluation: Once they know everything about the topic, and they have prepare their advertisements in groups of 4, students will present their final task and address questions to each team.
	Produce 20 minutes 24 students Tutor is available After their presentations, the tutor will check if students know the specific contents of the unit using a game