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**WE ARE EUROPE**

**Sustainable Development**



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**Guide**

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**Erasmus+**  
Enriching lives, opening minds.



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## Introduction

In a world facing unprecedented challenges, from climate change to social inequality, the pursuit of sustainable development has never been more critical. As we stand at the crossroads of our future, it's imperative that we equip ourselves with the knowledge and tools needed to create a better world for generations to come. This guide aims to complement the eBook of WeAreEurope SD, helping you harness the transformative potential of extra teaching material alongside an engaging story about sustainable development.

Sustainable development, as articulated by the World Commission on Environment and Development in 1987, entails "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." It represents a comprehensive vision of development that encompasses human populations, flora, fauna, ecosystems, and vital natural resources such as water, air, and energy. This vision integrates concerns such as poverty alleviation, gender equality, human rights, universal education, healthcare, human security, intercultural dialogue, and more.

The 2030 Agenda for Sustainable Development, adopted by all United Nations (UN) Member States in 2015, is built around the 17 Sustainable Development Goals (SDGs), which are conceived as an urgent call for action by all countries - developed and developing.

Target 4.7 explicitly mentions Education for Sustainable Development (ESD): "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development."

UNESCO led the United Nations Decade of Education for Sustainable Development (2005-2014), published several reports on "Learning for a Sustainable World", in 2009, 2012 and 2014.

UNESCO defines ESD as "education that encourages changes in knowledge, skills, values and attitudes to enable a more sustainable and just society for all. ESD aims to empower and equip current and future generations to meet their needs using a



balanced and integrated approach to the economic, social and environmental dimensions of sustainable development” and recommends that ESD is integrated into education policies as a holistic and transformational education approach, connected to learning contents and outcomes, to a certain pedagogical methodological framework and to concerns related to the learning environment (UNESCO, 2014, 2018).

Within the WeAreEurope SD project, ESD is treated through the story, presented in the eBook. Additional material is included in this guide in order to facilitate ESD in formal classrooms, by addressing problems of the real world, through the story designed for this purpose.

The next section presents ways of using the eBook as standalone teaching material or in combination with the material included in this guide.



## WeAreEurope Material Utilization for ESD

The main product of Output 1 (O1) comprises of two items: the eBook and the Guide. The eBook is an illustrated story, about the journey of four friends to the future, where they realize the outcomes of human activity. Furthermore, this guide provides complementary material to the story, assisting ESD in the classroom (or other settings) through more structured activities.

In this section, two main ways of approaching ESD through the WeAreEurope SD material are presented.

### Approach No 1

The first proposed approach is to utilize the eBook as standalone teaching resource. Within the four heroes' trip, the impact of current human activity on our planet is presented. As the heroes visit famous landmarks in the countries of the project's partners, they are surprised to see unexpected sceneries. This is complemented by the illustrations which present familiar scenes from today's world.

Thus, in this first approach the students can go through the story on their own or with the support of the teacher (based on their age and their ability to read autonomously or not) and reflect on this impact. A correlation with photographs of the corresponding places as they are today may reveal the differences and be utilized as trigger for group activities, mainly of a discussion nature. The following set of questions can be used to initiate reflective discussions with the children (in groups or plenary):

- Can you recognize where the scene takes place?
- Do you know how it is today?
- Search online or use Google Maps in order to see how it is today
- What differences do you see?
- Can you name the reasons why such differences exist?
- Can you imagine the causes of these differences?
- Can something be done to avoid this impact? When?

Following such a structure, additional activities can be implemented, following your curriculum.



## Approach No 2

The second proposed approach is to utilize the eBook in combination with the material included in this guide. There are proposed, complete lesson plans which are directly connected to the evolvement of the story, presented in the eBook. Thus, you may go through the story once and then re-narrate it, but pausing in the corresponding scenes in order to implement the proposed lesson plans.

Another idea is to go through the story step by step, implementing the proposed lesson plans, and re-narrate the story as a whole in the end. In this case, reflective questions such as the ones mentioned in the previous section can be utilized after the story being narrated for the second time.

## Material in this Guide

The core material in this guide are the proposed lesson plans. All are included in Appendix II, following the evolvement of the story. For your convenience, an empty activity template is included in Appendix I. It can be utilized in case you wish to create your own, appropriate activities or adapt the ones proposed here to your classroom's specific needs.



# APPENDIX I

## Activity Description Template



<b>Activity Title</b>	
<b>Category</b>	
<b>Learning goals</b>	
<b>Material needed</b>	E.g. papers, markers, board, etc
<b>Digital Resources</b>	Videos, presentations, etc
<b>Activity type</b>	Project/experiment/video/construction/discussion/other (choose all that fit)
<b>Proposed duration</b>	In minutes, hours or days (in the case of project)
<b>Class distribution</b>	Plenary/Groups (proposed number and size)
<b>Activity Description</b>	Step by step description with proposed duration of each step (how to implement it)
<b>Comments</b>	Anything else worth mentioning (e.g. extension ideas, possible variations (e.g. if something needed is missing from the class, how can it be done otherwise)





## APPENDIX II

### Activities



Activity Title	Causes and consequences of air pollution
<b>Category</b>	environment / resilience / energy
<b>Learning goals</b>	<ul style="list-style-type: none"> <li>- making students aware of the sources of air pollution,</li> <li>- understanding the causes and effects of air pollution,</li> <li>- explaining the impact of air pollution on organisms,</li> <li>- shaping appropriate behaviours aimed at preventing air pollution.</li> </ul>
<b>Materials needed</b>	paper, stationery (pens, pencils, markers, etc.)
<b>Digital Resources</b>	images (in appendix), youtube video  “What causes air pollution?”  <a href="https://www.youtube.com/watch?v=fephtPt6wk">https://www.youtube.com/watch?v=fephtPt6wk</a>
<b>Activity type</b>	discussion / description / brainstorming / crossword
<b>Proposed duration</b>	60 minutes
<b>Class distribution</b>	groups (up to 4 students each) / plenary
<b>Activity Description</b>	<p>The teacher presents two images (in appendix) and asks students to describe them. (5 minutes)</p> <p>The teacher starts the class discussion about the causes and consequences of air pollution. The teacher put students’ ideas down on the whiteboard in the form of a table (one column for causes and one for consequences). (10 minutes)</p> <p>The teacher plays the video “What causes air pollution?”. They discuss the video with students and complement the table with additional information from it. (10 minutes)</p> <p>Students work in groups. They prepare a simple crossword concerning the causes and consequences of air pollution. (20 minutes)</p> <p>Afterwards, they swap their crosswords to check what other groups have learnt. (10 minutes)</p> <p>The teacher summarises the topic. (5 minutes)</p>
<b>Comments</b>	Alternatively, the teacher can print out the images and stick them to the whiteboard.



The crosswords may have different lengths and forms (e.g. clues written or drawn) depending on the age and level of students.



Source: [www.freepik.com](http://www.freepik.com)



<b>Activity Title</b>	<b>An eco-town of the future</b>
<b>Category</b>	environment, resilience, energy
<b>Learning goals</b>	<ul style="list-style-type: none"> <li>- shaping pro-ecological attitudes among children,</li> <li>- raising awareness of the impact of human activities and decisions on the condition of the environment and the quality of life of people,</li> <li>- explaining the concept of an eco-town,</li> <li>- understanding the need to introduce pro-ecological solutions in cities,</li> <li>- stimulating the imagination and creativity of students,</li> <li>- developing manual and technical skills.</li> </ul>
<b>Materials needed</b>	paper, cardboard, boxes, stationery, recyclables, other materials to make a miniature town
<b>Digital Resources</b>	<p>youtube video (if)</p> <p>“Green City Model - Sustainable City”</p> <p><a href="https://www.youtube.com/watch?v=f_3CODsDzby">https://www.youtube.com/watch?v=f_3CODsDzby</a></p>
<b>Activity type</b>	discussion / project – a miniature model
<b>Proposed duration</b>	90 minutes
<b>Class distribution</b>	plenary / groups (up to 4 students each)
<b>Activity Description</b>	<p>The teacher triggers a discussion about ecology using the following questions. The teacher puts down the best ideas on the whiteboard. (10 minutes)</p> <ol style="list-style-type: none"> <li>1. What does it mean to be eco-friendly?</li> <li>2. What are examples of eco-friendly home items?</li> <li>3. Can a place be eco-friendly? What does it mean that a town is eco-friendly?</li> </ol> <p>Students work in groups. They prepare a miniature model of an eco-friendly town. They can use all the available materials. (65 minutes)</p> <p>Students present their miniature models to the class and describe them. (10 minutes)</p>



	The teacher summarises the lesson. (5 minutes)
<b>Comments</b>	<p>Alternatively, if a school is equipped with LEGO sets, they can be used to build a miniature model of an eco-friendly town.</p> <p>To help students understand the topic, the teacher can play the video “Green City Model - Sustainable City” before they start creating a model.</p>



Activity Title	What will the world look like in 2050?
<b>Category</b>	environment / resilience / energy
<b>Learning goals</b>	<ul style="list-style-type: none"> <li>- explaining the causes and effects of climate change,</li> <li>- understanding the impact of technical progress and urban sprawl on the natural environment,</li> <li>- explaining the impact of climate change on people's quality of life and health,</li> <li>- encouraging students to understand pro-ecological activities,</li> <li>- stimulating creativity and shaping artistic skills,</li> <li>- developing the ability to analyse and independently search for solutions.</li> </ul>
<b>Materials needed</b>	collage materials, paper, stationery (pens, pencils, markers, etc.)
<b>Digital Resources</b>	WAE SD eBook (scene 3), exemplary collage (in appendix)
<b>Activity type</b>	collage / reading / brainstorming / mind maps / discussion
<b>Proposed duration</b>	90 minutes
<b>Class distribution</b>	groups (up to 4 students each) / plenary
<b>Activity Description</b>	<p>The teacher explains what a collage is. They present an example of it (in appendix). (5 minutes)</p> <p>Students work in groups. They are given a task to make a simple collage showing a city in 2050. They present their works to the class and describe them. (25 minutes)</p> <p>The teacher asks and discusses the attached supporting questions. (10 minutes)</p> <ol style="list-style-type: none"> <li>1. How will the technology progress affect the environment?</li> <li>2. What is climate change? How will it affect the city's appearance?</li> <li>2. How may the environment change?</li> <li>3. How can climate change affect animals, plants and people?</li> </ol> <p>Students work in groups. They discuss the condition of the planet in 2050 in terms of environmental aspects and prepare mind maps. Each group is</p>



	<p>assigned a particular aspect: air, water, land, soil. They present their mind maps to the class. (15 minutes)</p> <p>Students read scene 3 from the WAE SD eBook. They discuss the appearance of the city. They make some changes to their city collages to include the possible environmental problems. (15 minutes)</p> <p>The teacher triggers a discussion concerning environment protection.</p> <p>Students work in groups again. They prepare mind maps including ideas how to avoid a grim future referring to the respective aspects: air, water, land, soil. (10 minutes)</p> <p>Students present their mind maps to the class. Other groups can provide additional ideas. (8 minutes)</p> <p>The teacher summarises the lesson. (2 minutes)</p>
<b>Comments</b>	<p>Before a lesson, students may be given homework to think what a city may look like in 2050 and how to present it in the form of a collage.</p> <p>Students can be asked to bring materials for the collage (e.g. newspapers, magazines, etc.) Alternatively, the teacher can provide necessary articles.</p> <p>While making collages students will probably focus only on technological aspects ignoring the environmental issues. Because of that, the discussion part may be crucial.</p>



Activity Title	Why isn't it nice to live in this city?
<b>Category</b>	environment / resilience / energy
<b>Learning goals</b>	<ul style="list-style-type: none"> <li>- making children aware of the impact of human activity on the state of the natural environment,</li> <li>- explaining the relationship between the state of the natural environment and the comfort of life and health,</li> <li>- shaping pro-ecological attitudes among children</li> </ul>
<b>Materials needed</b>	colour papers / sticky notes, a factory chimney made of cardboard boxes, stationery
<b>Digital Resources</b>	WAE SD eBook (scene 3)
<b>Activity type</b>	reading / description / brainstorming / discussion
<b>Proposed duration</b>	35 minutes
<b>Class distribution</b>	groups (up to 4 students each) / plenary
<b>Activity Description</b>	<p>Students read scene 3 from the WAE SD eBook. They describe the setting (the appearance of the city). (10 minutes)</p> <p>The teacher puts down on the whiteboard the leading question – “Why isn't it nice to live in this city?”</p> <p>Students work in groups. They discuss the question and write down their ideas. (10 minutes)</p> <p>The brainstorming session is followed by a class discussion. The best ideas are stuck to a high factory chimney made out of cardboard boxes. (10 minutes)</p> <p>The teacher summarises the activity. (5 minutes)</p>
<b>Comments</b>	<p>Depending on the class size, the groups may be smaller or students may work in pairs.</p> <p>Alternatively, a factory chimney may be drawn on the whiteboard.</p>



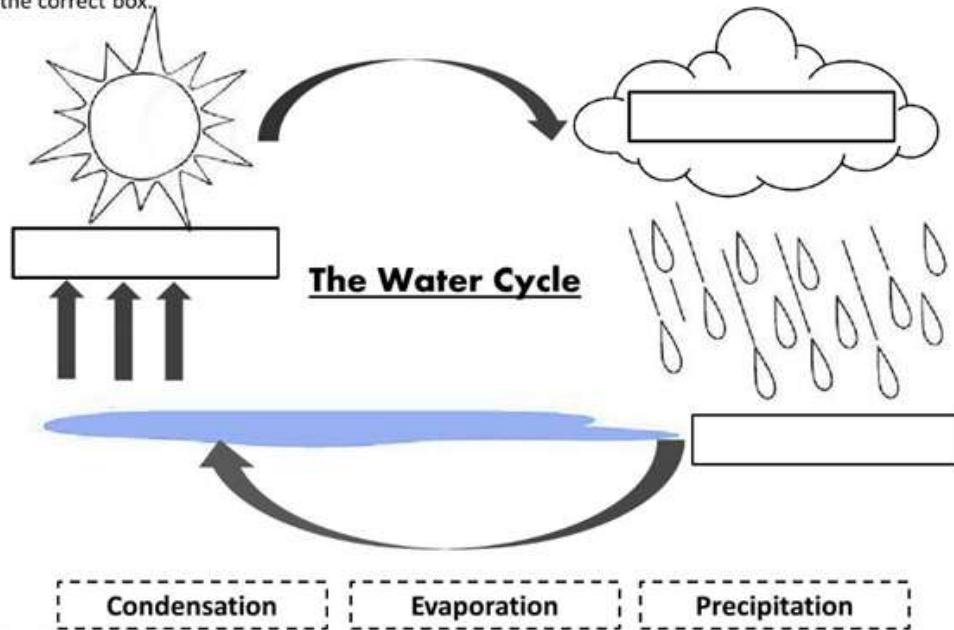


Activity Title	Water cycle
Category	environment / resilience / energy
Learning goals	<ul style="list-style-type: none"> <li>- explaining the process of the water cycle in nature,</li> <li>- acquiring the knowledge of the properties of water,</li> <li>- developing the ability to make an observation and draw conclusions independently.</li> </ul>
Materials needed	a plastic bag, water, a permanent marker, food colouring (if), adhesive tape, a table lamp (if), stationery, worksheets (in appendix)
Digital Resources	unneeded
Activity type	experiment / observation / discussion
Proposed duration	45 minutes
Class distribution	groups (up to 4 students each) / plenary
Activity Description	<p>Students work in groups. Each group follows the teacher's instructions to carry out an experiment explaining the water cycle. Each group is given the necessary materials for the experiment. (15 minutes)</p> <p>Students observe the results of the experiment and discuss them with the teacher. (15 minutes)</p> <div data-bbox="518 1317 1197 1601" data-label="Image"> </div> <p>Students work in groups and fill in the water cycle scheme (appendix 1). They colour it afterwards. (10 minutes)</p> <p>The teacher summarises the topic. (5 minutes)</p>
Comments	<p>The experiment is shown and explained in the youtube video: <a href="https://www.youtube.com/watch?v=VZB44_X0pFw">https://www.youtube.com/watch?v=VZB44_X0pFw</a></p> <p>In case the day is not sunny or the windows are not exposed to the sunlight, the teacher can use the table lamp instead.</p>



To see better results of the experiment, it is recommended to divide the activity into two parts and start the second one (observation and conclusion) after a longer break.

**Directions:** Cut out the words at the bottom of the page. Then use your glue stick to glue each word in the correct box.

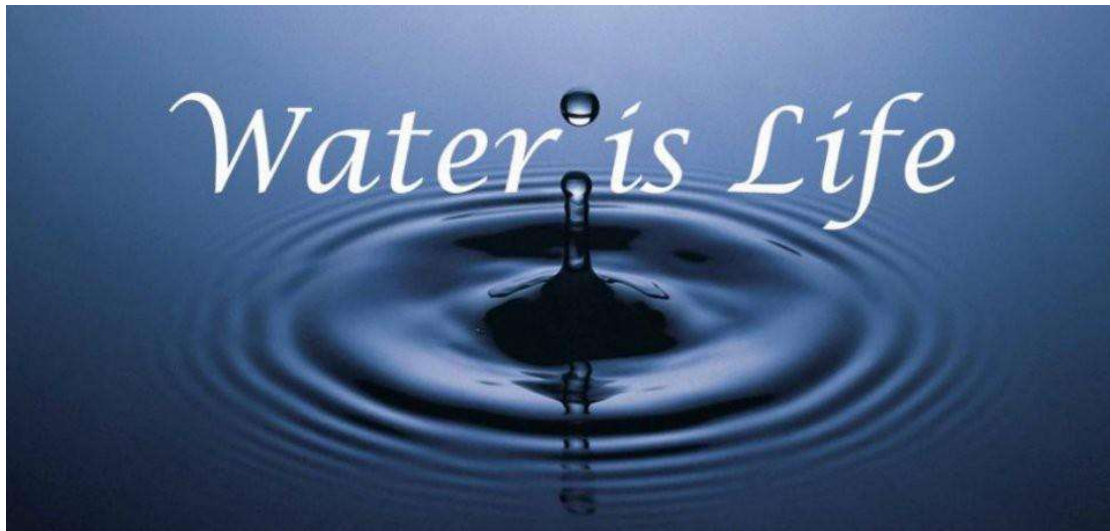




Activity Title	Water - life
Category	environment, resilience, energy
Learning goals	<ul style="list-style-type: none"> <li>- understanding the importance of water in the life of humans, plants and animals,</li> <li>- making students aware of the need to protect water,</li> <li>- persuading students to save water in their everyday life and indicating possible ways to do it.</li> </ul>
Materials needed	paper, stationery (pens, pencils, markers, etc.)
Digital Resources	image (in appendix), youtube video  "Importance of water in life"  <a href="https://www.youtube.com/watch?v=CT99lgYRtBM">https://www.youtube.com/watch?v=CT99lgYRtBM</a>
Activity type	reading / discussion / brainstorming / mind maps
Proposed duration	45 minutes
Class distribution	groups (up to 4 students each) / plenary
Activity Description	<p>Students read scenes 6 and 7 from the WAE SD eBook. As a follow-up, the teacher starts a discussion about the condition of the planet in the story. (10 minutes)</p> <p>The teacher puts down on the whiteboard the quote "Water = life" and shows the image from the appendix. Students try to explain its meaning. (5 minutes)</p> <p>Students work in groups. They brainstorm as to answer the questions below. They make mind maps. (15 minutes)</p> <p>Group 1 - Why do people need water?</p> <p>Group 2 - Why do animals need water?</p> <p>Group 3 - Why do plants need water?</p> <p>Students present their mind maps that can be complemented by other groups. (10 minutes)</p> <p>The teacher plays the video "Importance of water in life" and summarises the topic. (5 minutes)</p>




<b>Comments</b>	If the number of groups exceeds 3, one question can be assigned to more than one group.
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Source: <https://earth-justice.org/water-more-precious-than-gold/>



<b>Activity Title</b>	<b>Water pollution filter</b>
<b>Category</b>	environment, resilience, energy
<b>Learning goals</b>	<ul style="list-style-type: none"> <li>- making children aware of the role of clean water,</li> <li>- developing the ability to predict and draw conclusions based on observations,</li> <li>- developing manual and technical skills.</li> </ul>
<b>Materials needed</b>	plastic bottles, materials for filters (e.g. gauze bandage, paper towel, cotton wad) and water mixtures (e.g. small stones, potting soil, sand, flour, washing powder, salt, rice, etc.), measuring cups (plastic cups, jars, mugs), worksheets (in appendix)
<b>Digital Resources</b>	unneeded
<b>Activity type</b>	experiment / observation / discussion
<b>Proposed duration</b>	45 minutes
<b>Class distribution</b>	groups (up to 5 groups) / plenary
<b>Activity Description</b>	<p>Students work in groups. They prepare a water filter using a plastic bottle cut into two halves. They flip the bottle's top half over and put it in the bottom, so the top looks like a funnel. They build a simple filter in the top using materials provided by the teacher. (10 minutes)</p>  <p>The teacher prepares a few water mixtures with different substances.</p> <p>Students take a measuring cup of each mixture to check how easy it is to filter it. They measure the time necessary to filter each mixture and put it down on the worksheet (appendix 1) (20 minutes)</p>



	<p>The teacher discusses the task. They ask supporting questions to help students make conclusions. (10 minutes)</p> <ol style="list-style-type: none"><li>1. Did you manage to filter all the water mixtures? Was the water clean?</li><li>1. Which substance was filtered the fastest?</li><li>2. Which substance was filtered the slowest?</li><li>3. Can you see the link between the size of the particle and the time of filtering?</li></ol> <p>The teacher summarises the topic. (5 minutes).</p>
<b>Comments</b>	<p>For safety reasons, the bottles should be cut by the teacher.</p> <p>All the groups should use the same amount of each mixture to guarantee the correctness of the experiment.</p> <p>To measure the time, students can use timers or count seconds on their own.</p>



	<b>Mixture</b>	<b>Time to filter</b>
<b>1.</b>		
<b>2.</b>		
<b>3.</b>		
<b>4.</b>		
<b>5.</b>		



<b>Activity Title</b>	<b>3Rs - Reduce, reuse, recycle</b>
<b>Category</b>	environment, resilience, energy
<b>Learning goals</b>	<ul style="list-style-type: none"> <li>- explaining the 3Rs principle and understanding key concepts: reuse, recycle and reduce,</li> <li>- making students aware of the problem with waste,</li> <li>- shaping appropriate behaviours among students related to waste management,</li> </ul>
<b>Materials needed</b>	paper, stationery (pens, pencils, markers, etc.), everyday items (a cereal box, a plastic cup, a newspaper, a plastic bottle, a jam jar, etc.)
<b>Digital Resources</b>	<p>image (in appendix), youtube videos</p> <p>Why is recycling important?</p> <p><a href="https://m.youtube.com/watch?v=7UuUeoyYmxI&amp;pp=ygUXQWR2YW50YWdlcyBvZiByZW55Y2xpbmc%3D">https://m.youtube.com/watch?v=7UuUeoyYmxI&amp;pp=ygUXQWR2YW50YWdlcyBvZiByZW55Y2xpbmc%3D</a></p> <p>Reduce, reuse, recycle, to enjoy a better life:</p> <p><a href="https://m.youtube.com/watch?v=OasbYWF4_S8&amp;pp=ygUPV2hhdCBpcyByZXVzaW5n">https://m.youtube.com/watch?v=OasbYWF4_S8&amp;pp=ygUPV2hhdCBpcyByZXVzaW5n</a></p>
<b>Activity type</b>	discussion / brainstorming / poster
<b>Proposed duration</b>	90 minutes
<b>Class distribution</b>	groups (minimum 4 groups up to 4 students each) / plenary
<b>Activity Description</b>	<p>The teacher presents the image (see the appendix) showing the 3Rs rule: reduce, recycle, reuse. Students try to explain the terms. The teacher can ask supporting questions to help them. (10 minutes)</p> <p>Students work in groups. Each group is assigned a different question. They try to come up with ideas to answer them. (10 minutes)</p> <ol style="list-style-type: none"> <li>1. How can you reduce the use of water?</li> <li>2. How can you reduce the use of energy?</li> <li>3. How can you reduce the use of paper?</li> <li>4. How can you reduce the use of plastic?</li> </ol>





	<p>Students present the task to the class. Other groups can complement the list of ideas. (10 minutes)</p> <p>Students work in groups again. The teacher shows some everyday items - a cereal box, a plastic cup, a newspaper, a plastic bottle, a jam jar.</p> <p>Students draw one thing and try to come up with alternative methods to use it. They present their ideas to the class. Other students can also complement the list. (10 minutes)</p> <p>The teacher starts a discussion about the advantages of waste segregation. They play the video "Why is recycling important?". Afterwards, the teacher discusses the video with students. (10 minutes)</p> <p>Students work in groups again. They prepare posters presenting the advantages of waste segregation entitled - "Recycling - it will pay off for us". (30 minutes)</p> <p>Students present their works to the class. (5 minutes)</p> <p>The teacher plays the video "Reduce, reuse, recycle, to enjoy a better life" and summarises the topic. (10 minutes)</p>
<b>Comments</b>	<p>If the number of groups exceeds 4, one question can be assigned to more than one group.</p> <p>The composition of the group may change in every task.</p> <p>The lesson plan can be easily simplified allowing the teacher to select the tasks.</p>



Source: <https://testbook.com/question-answer/the-rule-of-three-rs-to-get-rid-of-waste--5f86d69ad5624bc44f17c7b1>



<b>Activity Title</b>	<b>'Don't waste your waste!'</b>
<b>Category</b>	environment, resilience, energy
<b>Learning goals</b>	<ul style="list-style-type: none"> <li>- familiarising students with endangered species in selected European countries,</li> <li>- raising awareness of the need to protect endangered species,</li> <li>- consolidating the principles of recycling and its importance in waste management,</li> <li>- explaining the impact of waste management on the natural environment,</li> <li>- improving the ability to independently search for information,</li> <li>- developing creativity and artistic abilities.</li> </ul>
<b>Materials needed</b>	recyclable items/materials, stationery (glue, scissors, adhesive tape, etc.)
<b>Digital Resources</b>	<p>youtube video</p> <p>"Don't waste your waste"</p> <p><a href="https://www.youtube.com/watch?v=Ptp6JGAF3o0">https://www.youtube.com/watch?v=Ptp6JGAF3o0</a></p>
<b>Activity type</b>	information search / project - a model / discussion
<b>Proposed duration</b>	60 minutes
<b>Class distribution</b>	pairs or groups (minimum 4 groups up to 4 students) / plenary
<b>Activity Description</b>	<p>Students bring to school various recyclable items/materials (e.g. plastic bottles, newspapers, etc.).</p> <p>Students work in groups. Using the Internet, they make a list of endangered species in different European countries (Greece, Poland, Italy, Portugal). (10 minutes)</p> <p>Students choose an animal and make a model of it using materials they have. (20 minutes)</p> <p>They list the endangered species in their respective countries and present the models they have prepared. (10 minutes)</p>




	<p>The teacher summarises the activity and triggers class discussion about recycling and reusing. Students try to create definitions of these two terms. (10 minutes)</p> <p>The teacher presents the video “Don’t waste your waste” and summarises the topic. (10 minutes)</p>
<b>Comments</b>	<p>Alternatively, if the use of the Internet is not possible, the teacher can distribute the list of endangered animals in the given countries. The list of countries can also be expanded.</p> <p>What is more, recyclables may be prepared by the teacher who will distribute them during the lesson.</p>



<b>Activity Title</b>	<b>Let's segregate rubbish!</b>
<b>Category</b>	environment, resilience, energy
<b>Learning goals</b>	<ul style="list-style-type: none"> <li>- shaping pro-ecological habits in everyday life,</li> <li>- developing a proper attitude to environmental protection,</li> <li>- shaping the ability to take specific actions, i.e. sorting waste.</li> </ul>
<b>Materials needed</b>	paper rolls, sheets of paper, stationery (paints, pencils, scissors, paper glue, etc.), worksheets (appendix 2 and 3)
<b>Digital Resources</b>	<p>online article</p> <p><a href="http://www.funkidslive.com/learn/top-10-facts/top-10-facts-about-recycling/">www.funkidslive.com/learn/top-10-facts/top-10-facts-about-recycling/</a></p> <p>statistics (in appendix)</p>
<b>Activity type</b>	reading and analysing / discussion / brainstorming / cut-and-paste
<b>Proposed duration</b>	60 minutes
<b>Class distribution</b>	pairs / plenary
<b>Activity Description</b>	<p>The teacher projects the article "Top 10 facts about Recycling!". They discuss every point with students. Alternatively, the teacher can use the statistics from the appendix 1. (10 minutes)</p> <p>Students work in pairs and do the task about sorting waste into recyclable and compost (appendix 2). They cut and paste pictures in the correct bins. The task is checked and discussed by the teacher. (10 minutes)</p> <p>The teacher presents colourful boxes (recycling bins) that are used to segregate waste. Students try to match the box with the correct waste type. They put the correct stickers on each box (bin) (10 minutes)</p> <p>Students work in pairs. They use paper rolls or sheets of paper to make recycling bins. They name the bins correctly. (10 minutes)</p> <p>Students are given a worksheet with different waste items (appendix 2). They cut pictures and put them in the correct bins. (10 minutes)</p> <p>The task is checked and discussed by the teacher. (5 minutes)</p> <p>The teacher summarises the lesson. (5 minutes)</p>



		
<b>Comments</b>	<p>Please note that the system of rubbish segregation differs among European countries. Before a class, adjust the lesson plan to the rules of your country.</p> <p>Recycling boxes (bins) may be prepared with paper rolls or sheets of paper.</p>	



## RECYCLING BY THE NUMBERS

Below are some important facts about recycling:



If you lined up the plastic bottles tossed away each year, they would circle our planet **FOUR TIMES.**



Energy saved from recycling a glass bottle can light a light bulb as long as **FOUR HOURS.**

### RECYCLING SAVES MONEY FOR OUR COMMUNITIES.



Did you know that it costs only **\$30 PER TON** to recycle most materials?



On the other hand, it costs up to **\$50 PER TON** to take garbage to the landfill.

It takes **\$ to \$75** to burn it, which pollutes the air.



People have been recycling their trash **FOR THOUSANDS OF YEARS;** ancient civilizations would melt down old metal products such as knives and swords and various metal household items to make coins and other new items.

75% of garbage is recyclable but we only recycle **30%** in the US.



The average person in the US throws out **ALMOST FIVE POUNDS** of garbage daily - that is 251 tons per year - per person!



The typical American uses **17 TREES** each year in wood and paper products. Many of those products can be recycled.

We toss away enough paper and wood annually to heat **50,000 HOMES** for two decades.



The typical American gets **500 PIECES** of junk mail annually. Most of this is simply thrown away. It takes millions of trees to produce all that junk mail.



Recycle plastic bags by reusing them when you are at the grocery store or bring reusable cloth bags with you.



Glass can be recycled many times.



**17 MILLION BARRELS**

of oil are used to produce the plastic water bottles consumed in the United States each year.

A single aluminum can will sit in a landfill for at least **500 YEARS.** All aluminum cans may be recycled.



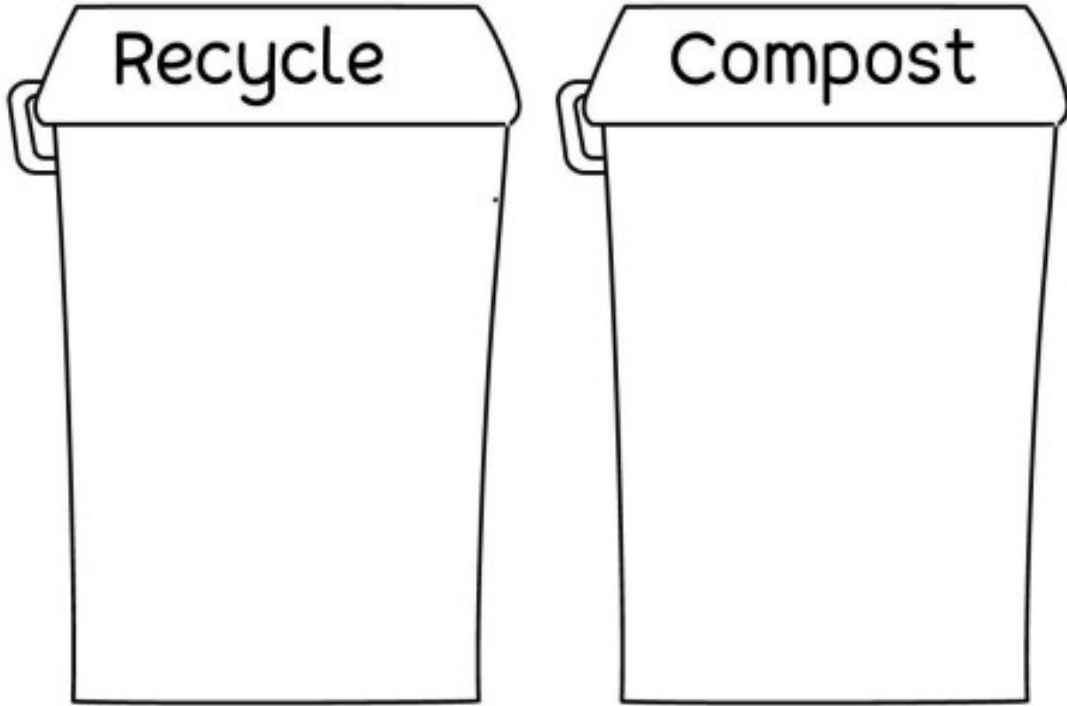
**ReuseThisBag.com**

Source: [www.reusethisbag.com](http://www.reusethisbag.com)

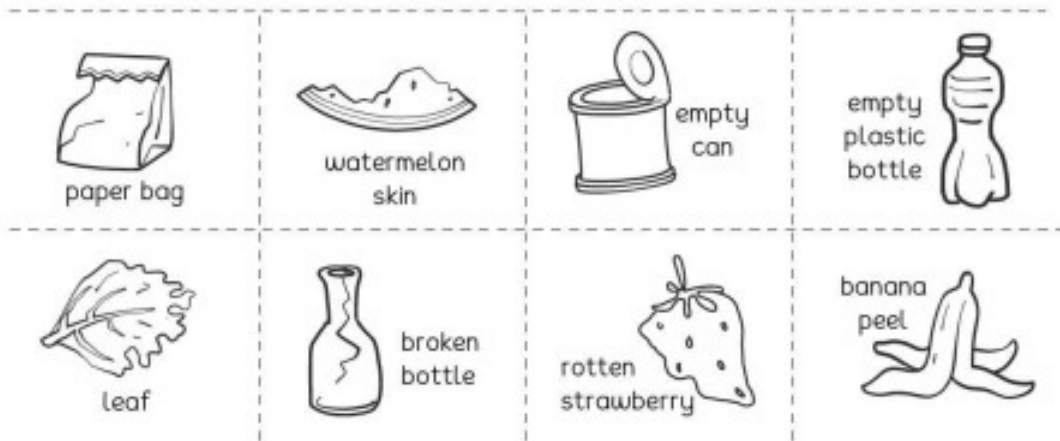


### Sort it out.

Cut and paste the pictures in their correct bins



www.cleverlearner.com



Source: www.cleverlearner.com





Source: <https://www.imagineourlife.com/tag/recycle/>



<b>Activity Title</b>	<b>'You can also save the planet!'</b>
<b>Category</b>	environment, resilience, energy
<b>Learning goals</b>	<ul style="list-style-type: none"> <li>- understanding the causes and effects of climate change,</li> <li>- explaining the impact of human activity on the degradation of the natural environment,</li> <li>- making students aware of the methods of counteracting climate change, - shaping pro-ecological behaviour among students.</li> </ul>
<b>Materials needed</b>	paper, stationery (pens, markers, etc.)
<b>Digital Resources</b>	<p>youtube video (if)</p> <p>“Climate Change - We are the problem and the solution”</p> <p><a href="https://www.youtube.com/watch?v=-D_Np-3dVBO">https://www.youtube.com/watch?v=-D_Np-3dVBO</a></p>
<b>Activity type</b>	brainstorming / discussion / mind maps
<b>Proposed duration</b>	30 minutes (45 minutes if the video is used)
<b>Class distribution</b>	groups (minimum 3 groups up to 4 students) / plenary
<b>Activity Description</b>	<p>Students work in groups and come up with ideas how to help the environment.</p> <p>Students brainstorm and prepare mind maps with ideas. (15 minutes)</p> <p>Group 1 - You can also protect the water.</p> <p>Group 2 - You can also protect the land.</p> <p>Group 3 - You can also protect the air.</p> <p>Students present their mind maps to the class. They complement them with other groups' ideas. (10 minutes)</p> <p>The teacher summarises the task and makes conclusions. (5 minutes)</p>
<b>Comments</b>	The lesson can start with the video “Climate Change - We are the problem and the solution” about the climate change and its consequences (Part 1). Then, as a follow-up to the class discussion, the teacher can play the second part of it (How do we stop this? / How can I help?)



Activity Title	When is the tree's birthday?
Category	
Learning goals	Students are expected to: <ul style="list-style-type: none"> <li>● Understand the importance of trees</li> <li>● Learn about measurement and data</li> <li>● Do simple math to calculate the age of a tree</li> </ul>
Material needed	Tree Measuring tape Marker Pen Paper
Digital Resources	<a href="https://www.youtube.com/watch?v=o6Uv5aCGcpc">https://www.youtube.com/watch?v=o6Uv5aCGcpc</a>
Activity type	Video/discussion/outdoor activity
Proposed duration	45 minutes
Class distribution	Plenary and/or Groups of 4-5
Activity Description	<p><b>Part 1 - Introduction to the topic (10 minutes)</b></p> <p>The teacher introduces the topic of the activity (Age of trees) and presents students with relevant information in order to allow them to understand why it is an important topic. There is a difference between measuring height or length and calculating age.</p> <p>Every year on our birthday we have a reminder of how old we are. And if we ever forget, we can always ask our parents! How do you think you find out how old a tree is? When a tree has been cut down, you can count its "rings" in order to tell how old it is, but what about when it is alive? We can't ask a tree how old it is. But there is a way!</p> <p><b>Part 2 – Measuring worksheets and outdoor activity (35 minutes)</b></p>

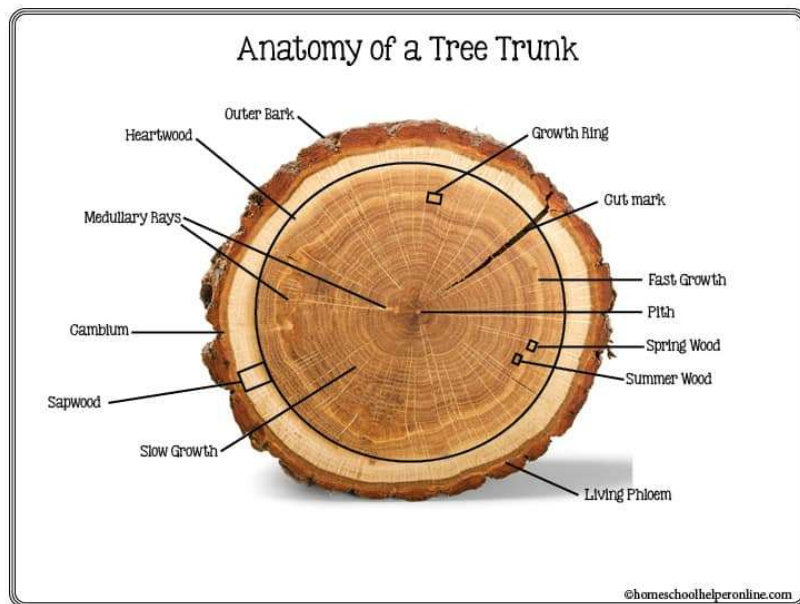


Use the different worksheets to measure length and height until the students become familiar with the procedure, can perform simple math and use the data.

Then go outside and find a tree to calculate its age and determine when it is the time to prepare its birthday party!

Find a tree that is at least as tall as a grown up and have the students wrap the measuring tape around the widest part of the trunk. (Other students might need to help with this part!) The distance around the trunk of a tree is called the circumference. Write this measurement down on a piece of paper. The measurement of the circumference in inches is also the approximate age of the tree in years!


Every year a new layer of growth occurs just under the bark. Some trees like firs and redwoods may grow more than this in a year, while others like cedars may grow less. This method is a good rule of thumb to estimate the age of a tree.



**Comments**

Teachers could further expand the learning around trees and introduce their students to the science of the seasons and how do trees change and/or learn about the different parts of the trees.



<b>Activity Title</b>	<b>EU “Clean Air” Convention Trivia</b>
<b>Category</b>	
<b>Learning goals</b>	<p>Students are expected to:</p> <ul style="list-style-type: none"> <li>• Hone their research and data analysis skills</li> <li>• Understand the connection between data and decision making</li> </ul>
<b>Material needed</b>	<p>Custom-made voting signs with YES on one side and NO on the other side</p> 
<b>Digital Resources</b>	Trivia-styled presentation with proposals for minimizing air pollution
<b>Activity type</b>	Research/Discussion/Role-play
<b>Proposed duration</b>	90 – 135 minutes (2-3 lessons of 45’ each)
<b>Class distribution</b>	Plenary and/or Groups of 4-5
<b>Activity Description</b>	<p><b>Part 1 - Introduction to the topic (10 minutes)</b></p> <p>The teacher introduces the topic of the activity (Air pollution), presents the students with statistical data and forecasts in order to allow them to understand why it is an important topic and summarizes some of the most typical causes, challenges and proposed solutions.</p> <p><b>Part 2 - Research (35 minutes)</b></p> <p>Students are asked to explore one or more of the Air Quality platforms operated by the UN (United Nations), ESA (European Space Agency) and EEA (European Environment Agency), examine the data offered, conduct Internet research if necessary and come up with a number of conclusions regarding the causes behind air pollution in a specific country or city.</p> <p><b>Part 3 - Role playing game (45 minutes)</b></p> <p>The students take the role of EU ministers that are assigned to decide on future actions to clean European air.</p>



	<p>Each student will be given a YES/NO voting sign. Proposed actions will be displayed on the board. The students are asked to vote.</p>
<p><b>Comments</b></p>	<p>Depending on the age of the students, the activity could be further enhanced and become more representative of the real world. For example, groups of students could be formed, each group assigned a different country. A fact sheet with economic and other data could be provided to each group, and each student within a group could be assigned a different Ministry (Minister of Finance, Environment, etc). Groups will be allowed 5 minutes to discuss whether to accept or not a proposed action.</p> <p>The role-playing game could be performed on a national or municipal level, if the teacher wants to follow a more localized approach. In this respect, instead of a UN Convention, the context could be a Municipal Council or a Ministry Council.</p>



Activity Title	Deforestation in a bottle
Category	
Learning goals	<p>Students are expected to:</p> <ul style="list-style-type: none"> <li>● Understand the importance of trees</li> <li>● Get familiar with soil erosion</li> <li>● Contact an experiment/project to see the results in action</li> </ul>
Material needed	<p>1 piece of ply wood (30cm x 30cm x 2cm thick)</p> <p>6 empty 2 liter bottles</p> <p>Wood glue</p> <p>Scissors</p> <p>String</p> <p>Soil from the garden and compost</p> <p>4 seedlings of flowers or grass</p> <p>Mulch (bark chips, dead leaves and sticks)</p> <p>Hole puncher</p>
Digital Resources	<p><a href="https://www.youtube.com/watch?v=-01T9e6VDWU">https://www.youtube.com/watch?v=-01T9e6VDWU</a></p> <p><a href="https://www.youtube.com/watch?v=im4HVXMG168">https://www.youtube.com/watch?v=im4HVXMG168</a></p>
Activity type	Video/discussion/construction
Proposed duration	45 minutes
Class distribution	Plenary and/or Groups of 4-5
Activity Description	<p><b>Part 1 - Introduction to the topic (10 minutes)</b></p> <p>The teacher introduces the topic of the activity (Deforestation) and presents students with relevant information in order to allow them to understand why it is an important topic. During this part, the students learn about soil erosion and focus on one of its causes which is rain flowing over the soil surface and washing it away. The soil becomes saturated and unable to absorb any more water. One way to fight soil erosion is to use plants! Plants have root systems that "grab onto" soil</p>





	<p>and keep it clumped together. Plants also help absorb some of the water in the soil. This in turn makes it harder for the rain water to wash the soil away.</p> <p><b>Part 2 - Soil Erosion Science Experiment (35 minutes)</b></p> <p>First: Prepare three of the bottles by cutting a rectangular opening roughly 3 inches x 10 cm along the side of the bottle. Use a permanent marker to draw the rectangle before you cut.</p> <p>Second: Stick the bottle to the wood with wood glue making sure that the necks of the 3 bottles hang a little over the edge of the board. Fill the first bottle with plain garden soil and the other 2 with a soil and compost mixture. Press down firmly to make it nice and compact.</p> <p>Third: Leave the first bottle alone. Now, cover the top of the soil in the second bottle with your mulch (bark chips, dead leaves and sticks etc). Plant the seedlings in the 3rd bottle. Make sure you plant them tightly together and press down firmly to compact the soil.</p> <p>Next: Cut the other 3 bottles in half, horizontally and keep the bottom halves (see picture above). Make 2 small holes opposite each other, nearest the cut side of the bottle. Cut 3 pieces of string, roughly 10 inches long and thread each end into the holes. Tie a knot on the ends to secure them. This will form a nice bowl to collect the water. Hang the bowls over the necks of each bottle using the string.</p> <p>Finally: Make it rain! Slowly pour equal amounts of water in each of the bottles. Pour the water in at the end furthest from the neck of the bottle to simulate rain moving through soil. Observe the color of the water collecting in the bowls. You can add water to the bottles every day and see what happens to the soil over a period of a week. Make observations and find out why plants are important to our environment.</p>
<b>Comments</b>	By involving the students in the process, they practice empathy. They are also dedicated to the experiment while waiting for a week to make





	<p>observations and understand the importance of what they have been taught about our environment.</p> <p>Students could also be motivated to practice green activities at home or at school at their garden or plants in their classroom. Let them think of other ideas that could help the environment and try to apply them.</p>
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Activity Title	Flood
<b>Category</b>	
<b>Learning goals</b>	<p>Students will understand the following:</p> <ol style="list-style-type: none"> <li>1. Different types of soil have different capacities for retaining rainwater.</li> <li>2. If the soil in an area will not hold enough rainwater, flooding problems will ensue.</li> <li>3. Soil can be tested for its water-retaining capacity.</li> </ol>
<b>Material needed</b>	<p>The following materials should be distributed to each group:</p> <ul style="list-style-type: none"> <li>• Three soil samples: sand, agricultural soil (potting soil), and clay</li> <li>• Water</li> <li>• Three measuring cups</li> <li>• Funnel</li> <li>• Filter paper</li> </ul>
<b>Digital Resources</b>	Videos, presentations, etc
<b>Activity type</b>	experiment/discussion/other
<b>Proposed duration</b>	1 or 2 class periods (in case of extension)
<b>Class distribution</b>	Groups of 4
<b>Activity Description</b>	<p><b>Procedure:</b></p> <ol style="list-style-type: none"> <li>1. Introduction to the topic with the video "flooding explanation": <a href="https://www.youtube.com/watch?v=udRNUBHbE0o">https://www.youtube.com/watch?v=udRNUBHbE0o</a> or with the video "why do floods happen": <a href="https://www.youtube.com/watch?v=Qe350nm_odA">https://www.youtube.com/watch?v=Qe350nm_odA</a></li> <li>2. Present the following scenario to your students. The class is a team of "consulting engineers" for a new housing development to be built in the next county. Many of the county's citizens are protesting the development. They are saying that the soil in that area will not hold the rain and there will be flooding problems for all dwellings in that area. But others believe this is just an excuse to delay and block the development.</li> <li>3. Tell students that their challenge is to aid in the decision-making process by testing different samples of soil to see how much water the soil will absorb.</li> <li>4. Divide your class into small groups, distributing materials to each group.</li> <li>5. Students should first test each type of soil in its dry state by measuring the same amount of each soil, in turn, into a funnel lined with filter paper, and then pouring a measured amount of water through it. They should use the same amount of water for each type of soil. The water that drains through each type of soil should be collected in another measuring cup and the amount recorded.</li> </ol>



	<ol style="list-style-type: none"> <li>6. Have students repeat the test using the same types of soil in their saturated states.</li> <li>7. Discuss with the class which soil held the most water when dry and which saturated soil held the most water. Which type of soil would be most likely to cause flooding problems?</li> <li>8. Have each student write a lab report describing the soil tests, including an explanation of how communities and developers would use such tests.</li> </ol> <p><b>Discussion Questions:</b></p> <ol style="list-style-type: none"> <li>1. Explain why a river can flood even if there was no recent rain in that section of the river valley?</li> <li>2. Why are sediments found in rivers? Discuss how rivers carry sediments and explain how this impacts the land during a flood.</li> <li>3. What characteristics determine how much water soil can hold?</li> <li>4. Debate the merits of building dams upstream to prevent flooding- thereby making former floodplains available for development.</li> <li>5. Discuss why hydrologists-scientists who study the water cycle-track snow accumulation as a part of long-term flood forecasting. What other data would help them make more accurate flood predictions?</li> <li>6. Debate whether or not people should be allowed to rebuild homes in an area prone to serious flooding.</li> </ol> <p><b>Evaluation:</b> You can evaluate your students on their lab reports using the following three-point rubric: Three points: accurate and complete description of each soil test; clear explanation of how tests would be used; careful and error-free writing Two points: satisfactory description of each soil test; explanation of how tests would be used lacking in clarity; some writing errors One point: sketchy description; unclear explanation or no explanation; numerous writing errors You can ask your students to contribute to the assessment rubric by determining what information should be included in the description of each soil test.</p>
<b>Comments</b>	<p><b>Extension:</b></p> <p><b>Cities and Floods</b> Have students use either a map of the United States or a large local map to locate and label major rivers on the map. Students can then label major cities near the rivers. Divide the class into groups to research a particular city and the river associated with it. The research students gather should include historical, geographical, geological, and</p>



	<p>meteorological information on their river and city. Information could include the following: when the city was founded, what industries make particular use of the river, what the elevation of the city is, where the town cemetery was built, what year and season the last flood occurred, how high the river has risen, and whether the city has taken precautions against future floods.</p> <p><b>Measure Flood Velocity</b></p> <p>Use a stream table to explore with your students the impact of slope on water velocity. (If you don't have a stream table, a long rectangular planter, wallpaper trough, or piece of gutter will also work.) Arrange your equipment so that students can vary the height of the container and thereby change the slope. Fill the container with sand, potting soil, or clay. Using a measured amount of water and a watch with a second hand, students can determine the velocity of the flow based on the height (slope) and length of the container. With each change in the slope of the container, have students draw the erosion patterns. Students can display their results in a graph and discuss ways that communities use this type of data. For example, they might observe the edges of a highway from a safe location and then, back in class, discuss how engineers have designed highways to be protected from high-velocity running water. How is erosion prevented?</p>
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Activity Title	Sea level rise
Category	
Learning goals	<p>Students are expected to:</p> <ul style="list-style-type: none"> <li>● Define sea level rise and identify its causes.</li> <li>● Understand the potential impacts of sea level rise on coastal areas and communities.</li> <li>● Demonstrate knowledge of simple scientific concepts related to sea level rise through hands-on activities and NASA JPL satellite data</li> </ul>
Material needed	<p>Large container or basin (representing an ocean)</p> <p>Clay or modeling dough</p> <p>Small toy buildings or figurines</p> <p>Ruler or measuring tape</p> <p>Blue food coloring (optional)</p> <p>Whiteboard and markers</p> <p>Access to NASA JPL sea level rise data (images, graphs, or animations)</p>
Digital Resources	<p><a href="https://climate.nasa.gov/vital-signs/sea-level/">https://climate.nasa.gov/vital-signs/sea-level/</a></p> <p><a href="https://www.jpl.nasa.gov/edu/teach/activity/the-science-of-earths-rising-seas/">https://www.jpl.nasa.gov/edu/teach/activity/the-science-of-earths-rising-seas/</a></p>
Activity type	Experiment / Data interpretation
Proposed duration	90 minutes
Class distribution	Plenary and/or Groups of 4
Activity Description	<p><b>Introduction (10 minutes):</b></p> <p>Begin by asking students if they know what sea level is and where it can be found. Make connections with the We are Europe story.</p>



	<p>Explain that today, they will learn about sea level rise using real data from NASA, which studies Earth and space.</p> <p>Engage students by asking if they have heard about rising oceans and why it matters.</p> <p><b>Activity 1: Modeling Sea Level Rise (25minutes):</b></p> <p>Follow the steps outlined in the original lesson plan to simulate sea level rise using the container, toy buildings, and clay.</p> <p>As you pour water into the container, pause and show students images or animations from NASA JPL that depict the melting of glaciers and ice sheets.</p> <p>Explain that these real-world events contribute to sea level rise, just like what they are simulating.</p> <p><b>Discussion (10 minutes):</b></p> <p>Engage the students in a discussion about the simulation and the NASA data.</p> <p>Ask questions like:</p> <p>How did the simulation show sea level rise affecting the coastline?</p> <p>How does the melting of glaciers contribute to rising sea levels, as shown by NASA?</p> <p>Why is it important to study sea level rise using data from organizations like NASA?</p> <p><b>Activity 2: Causes of Sea Level Rise with NASA Data (15 minutes):</b></p> <p>Show graphs or images from NASA JPL that illustrate the increase in global temperatures and the resulting sea level rise over time.</p>
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	<p>Discuss how warmer temperatures lead to melting ice and expanding seawater, as demonstrated by NASA's scientific data.</p> <p><b>Activity 3: Sea Level Rise Adaptation and NASA Solutions (15 minutes):</b></p> <p>Show images from NASA JPL that depict various ways people adapt to rising sea levels, such as building seawalls or using satellite technology to monitor changes.</p> <p>Explain how NASA uses satellites to measure sea level changes and gather important data.</p> <p><b>Conclusion (10 minutes):</b></p> <p>Review the main points of the lesson, emphasizing the connection between the hands-on simulation, NASA data, and real-world sea level rise.</p> <p>Highlight the significance of NASA's work in understanda</p> <p><b>Extension (Optional):</b></p> <p>Ask students to reflect and write a short paragraph or make a drawing about how NASA's data and technology contribute to our understanding of climate change and sea level rise.</p>
<b>Comments</b>	<p>This lesson plan integrates NASA JPL data to enhance students' understanding of sea level rise. It encourages critical thinking and provides a bridge between scientific concepts and real-world applications. Adjustments can be made based on students' interests and the availability of NASA data resources.</p>



Activity Title	Waste Sorting Championship
Category	
Learning goals	<p>Students are expected to:</p> <ul style="list-style-type: none"> <li>● Exercise their gross motor skills</li> <li>● Understand the importance of sorting waste</li> <li>● Get acquainted with the country-specific recycling trash cans</li> </ul>
Material needed	<p>Small sandbags with icons of different types of waste printed in each</p> <p>Rectangular paper baskets printed with images of recycling trash cans</p> <p>Printed “Waste Sorting Champion” badges for all students</p>
Digital Resources	Video, Presentation
Activity type	Video/discussion/outdoor activity
Proposed duration	45 minutes
Class distribution	Plenary and/or Groups of 4-5
Activity Description	<p><b>Part 1 - Introduction to the topic (10 minutes)</b></p> <p>The teacher introduces the topic of the activity (Waste sorting) and presents students with relevant information in order to allow them to understand why it is an important topic. During this stage, time must be allocated in order to present the national recycling policy. Depending on the age of the students, this could mean simply presenting the different trash cans available for recycling up to introducing country-specific recycling statistical data.</p> <p><b>Part 2 - Outdoor activity (35 minutes)</b></p> <p>Students are taken outdoors, split into teams (optional) and they are asked to randomly draw from a big basket or bag dummy waste (in the form of small printed sandbags) and throw them into the correct dummy trash can, positioned in a relative distance. Each student is allowed to throw as many sandbags as possible in a given period of time 1-3 minutes. When the time ends, the teacher counts all waste successfully thrown into the correct dummy trash can.</p>





<b>Comments</b>	<p>Students could be allocated into groups of 4-5 and each team maintains the highest score achieved by one of its members. In this case, the groups could be allowed a short period of time (10-15 minutes) to decide on their (relevant to waste sorting) team's name and draw a team poster.</p> <p>If there are more than one students or groups with a high score, then a head-to-head final can be organized, this time with the dummy trash cans positioned a little bit further than before.</p>
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Activity Title	Simulating Sea acidification
Category	
Learning goals	<p>Students are expected to:</p> <ul style="list-style-type: none"> <li>• Understand the concept of ocean acidification and its effects on marine life.</li> <li>• Explore the consequences of ocean acidification through hands-on experiments and discussions.</li> <li>• Practice critical thinking, observation, data recording, and teamwork skills.</li> </ul>
Material needed	<p>Clear plastic cups or containers</p> <p>Water</p> <p>pH indicator solution (red cabbage indicator or pH paper)</p> <p>Various substances to simulate ocean acidification (e.g., vinegar, lemon juice, baking soda, saltwater)</p> <p>Small seashells or pieces of coral (can be obtained from a craft store)</p> <p>Droppers or pipettes</p> <p>Chart paper or whiteboard</p> <p>Markers or colored pencils</p>
Digital Resources	<p><a href="https://ocean.si.edu/ocean-life/invertebrates/ocean-acidification">https://ocean.si.edu/ocean-life/invertebrates/ocean-acidification</a></p> <p><a href="https://www.youtube.com/watch?v=ogZkV-Yj7Hc">https://www.youtube.com/watch?v=ogZkV-Yj7Hc</a></p> <p><a href="https://www.youtube.com/watch?v=Am86_N752RA">https://www.youtube.com/watch?v=Am86_N752RA</a></p>
Activity type	Experiment / Simulation
Proposed duration	90 minutes
Class distribution	Plenary and/or Groups of 4-6
Activity Description	<p><b>Part 1 Introduction and Experiment Setup</b></p> <p>Introduction: (10 minutes)</p>



	<p>Begin by discussing the importance of oceans and their role in supporting marine life and ecosystems. Make connections with the We are Europe story.</p> <p><b>Activity - Simulating Ocean Acidification: (30 minutes)</b></p> <p>Divide students into small groups and provide each group with clear cups, pH indicator solution (make ph indicator from cabbage prior to the lesson - Instructions <a href="#">How to make the Red Cabbage pH Indicator!</a>), and various substances (vinegar, lemon juice, baking soda, saltwater).</p> <p>Instruct each group to add a few drops of pH indicator solution to their cups and observe the initial color.</p> <p>Guide students as they add a small amount of one of the substances to their cups and observe the color change. Discuss the color changes as a class.</p> <p><b>Discussion: Ocean Acidification and Marine Life: (20 minutes)</b></p> <p>Lead a class discussion on the color changes observed and their connection to ocean acidification.</p> <p>Make connections and engage discussion in order to enhance understanding of ocean adicification.</p> <p>Show video <a href="#">What Is Ocean Acidification?   A Cartoon Crash Course</a></p> <p>Introduce simply the concept of ocean acidification as a result of increased carbon dioxide (CO<sub>2</sub>) in the atmosphere and its absorption by the oceans.</p> <p>Explain that when CO<sub>2</sub> dissolves in seawater, it makes the water more acidic, which can harm marine organisms.</p> <p>Discuss how ocean acidification affects marine life, particularly organisms with calcium carbonate shells or skeletons, such as corals and shellfish.</p>
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	<p>Introduce the idea that ocean acidification can disrupt food chains and impact ecosystems</p> <p><b>Part 2 Experiment and Application</b></p> <p><b>Experiment: Impact on Seashells or Coral: (20 minutes)</b></p> <p>Provide small seashells or pieces of coral to each group.</p> <p>Instruct each group to place their seashell or coral in a cup with vinegar (simulating acidic conditions) and another in a cup with baking soda solution (simulating basic conditions).</p> <p>Have students predict and observe any changes to the seashells or coral over the next 24 hours.</p> <p><b>Data Analysis and Presentation: (20 minutes)</b></p> <p>Ask each group to record their observations and changes to the seashells or coral.</p> <p>Have groups share their findings and discuss how the experiment relates to ocean acidification and its impact on marine life.</p> <p>Discuss potential consequences for ocean ecosystems and food chains.</p> <p><b>Real-World Application and Reflection: (20 minutes)</b></p> <p>Discuss real-world examples of ocean acidification affecting coral reefs and shellfish industries.</p> <p>Guide students to think about actions they can take to help reduce carbon emissions and protect marine ecosystems.</p> <p>Encourage students to reflect on their role as young environmental stewards and share their thoughts in a brief journal entry.</p>
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	<p>Conclusion: (5 minutes)</p> <p>Summarize the key learnings from the lesson and highlight the importance of understanding ocean acidification and its consequences.</p> <p>Emphasize that small actions can make a positive impact on the environment.</p>
<b>Comments</b>	<p>This lesson plan focuses on the consequences of ocean acidification, engages students in hands-on experiments, and encourages discussions about real-world issues and environmental stewardship. It provides a tangible way for elementary students to explore the effects of acidity on marine life and fosters a sense of responsibility for protecting the oceans.</p>