Strategies for Mitigating Climate Change: Approaches and Actions for a Sustainable Future:

How can climate change be stopped and mitigated?

OPEN: WIDE MINDS WILL FIND ECO VIRTUAL STEAM SOLUTIONS TOWARDS CLIMATE CHANGE!
2022-1-RO01-KA220-SCH-000084942

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You cannot get through a single day without having an impact on the world around you. What you do makes a difference and you have to decide what kind of a difference you want to make.

- Jane Goodall

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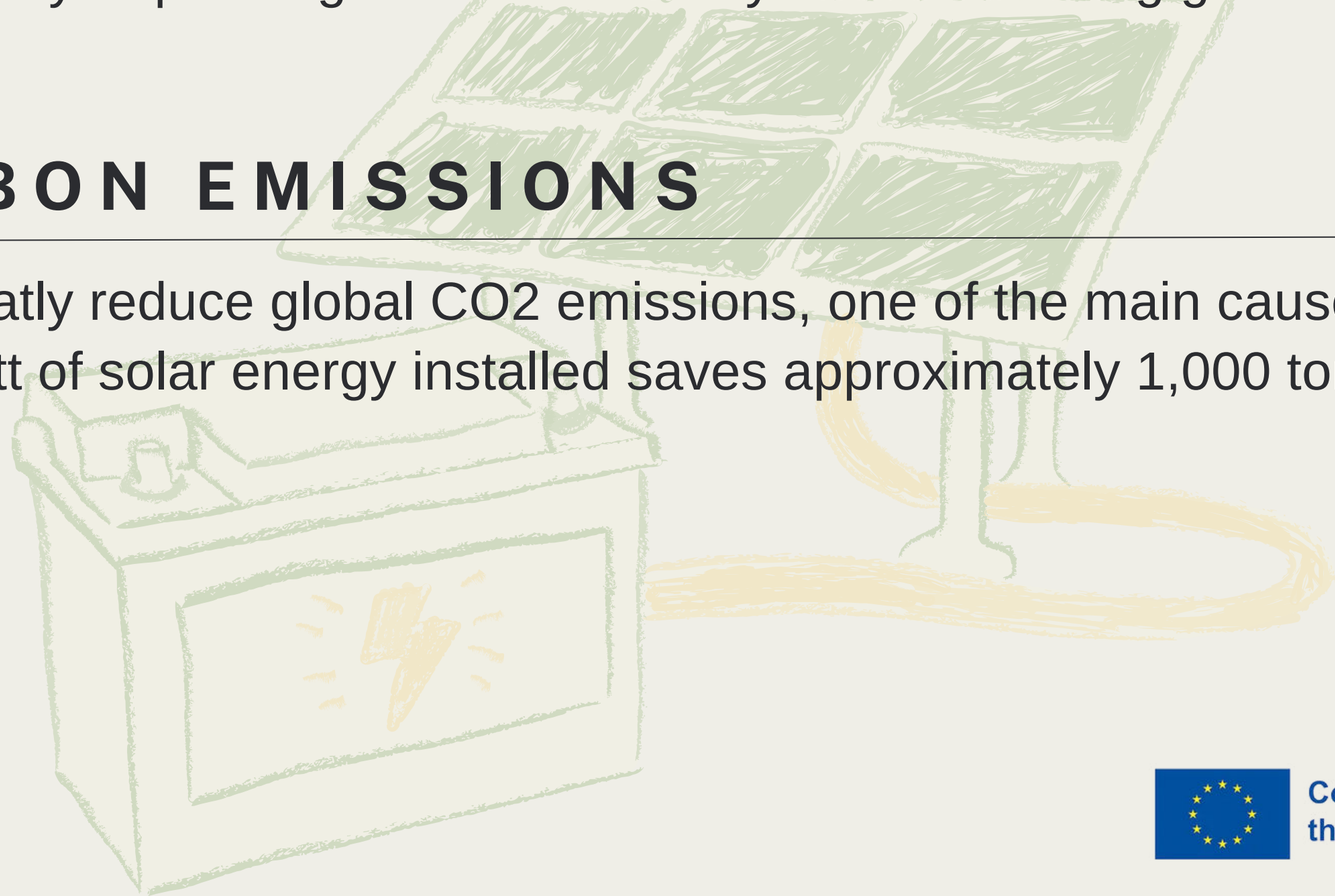
THE ROLE OF RENEWABLE ENERGY IN REDUCING CARBON FOOTPRINT

Renewable energy is at the forefront in the effort to reduce the global carbon footprint by offering clean, sustainable alternatives to fossil fuels. Unlike coal, oil, and natural gas, renewables like solar, wind, and hydropower generate electricity without emitting greenhouse gases.

IMPACT ON CARBON EMISSIONS

Renewable energy sources greatly reduce global CO2 emissions, one of the main causes of climate change. Every megawatt of solar energy installed saves approximately 1,000 tons of CO2 annually.



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EU TARGETS

The EU has set ambitious targets to increase the share of renewable energy in its final energy consumption and decrease greenhouse gas emissions!

By 2030, the EU aims to:

1. Reduce net greenhouse gas emissions by at least 55% compared to 1990 levels
2. Increase the share of renewable energy in gross final energy consumption to 42.5%, with an additional indicative target of 2.5% to reach 45%

Sources: https://www.eumonitor.eu/9353000/1/j9vvik7m1c3gyxp/vkmiobvzi1x7?ctx=vhsjgh0wpcp9; https://www.statistiques.developpement-durable.gouv.fr/edition-numerique/chiffres-cles-du-climat-2023/en/18-commitments-of-the-european-union; https://www.eea.europa.eu/en/about/contact-us/faqs/how-is-renewable-energy-helping-us-to-reach-the-eus-climate-and-energy-targets

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RENEWABLE ENERGY CONTRIBUTES TO CARBON FOOTPRINT REDUCTION IN SEVERAL WAYS: (1)

Electricity Generation

Renewable sources in the EU's power sector are increasing fast, with a related sharp decline in the use of fossil fuels and associated greenhouse gas emissions. Solar PV and wind are expected to reach 58% of power generation by 2050, up from 12% in 2015.

Energy Efficiency

The transition to renewable energy, added to energy efficiency measures, is expected to reduce final energy consumption by at least 11.7% at EU level in 2030 compared to projections for 2020.

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RENEWABLE ENERGY CONTRIBUTES TO CARBON FOOTPRINT REDUCTION IN SEVERAL WAYS: (2)

Sector Transformation

Buildings: The new regulations impose the installation of solar panels in new buildings, while aiming for zero-emission building stock by 2050.

Transport: EU is promoting the use of sustainable fuels and electrification. Renewables are the backbone in this sector to cut the emissions.

Industry: Large-scale renewable hydrogen and other clean technologies are supporting the decarbonization of hard-to-abate industrial processes.

Energy Security

Increasing the amount of renewable energy produced within the EU's borders will continue to decrease its reliance on imported fossil fuels, from **56% in 2015 to 27% in 2050**.

The transition to renewable energy and other measures, such as an Emissions Trading System and more energy efficiency, are cardinal points in the EU for the strategy of carbon neutrality by 2050.

https://unfccc.int/sites/default/files/resource/365_COMMIT%20Fact%20Sheet%20EU%20-%20a%20long-term%20low-emission%20pathway.pdf

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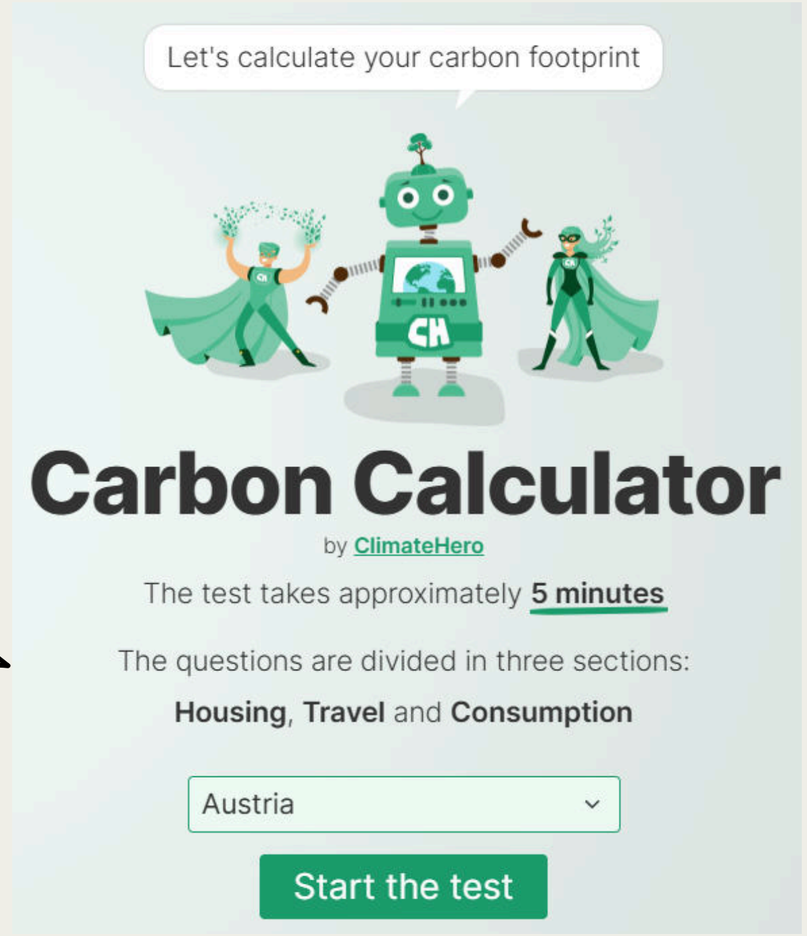
CARBON FOOTPRINT CALCULATOR

Carbon footprint calculator sites can greatly help students understand this term in a concrete way. By quantifying the **environmental impact of daily habits**, these sites make students realise **how their individual activities contribute to carbon emissions**. In this way, students learn to make more informed decisions on issues such as **energy consumption**, **transport**, **nutrition** and **waste management**, and gain motivation to reduce their impact on the environment.

For example:
https://carbon-calculator.climatehero.org/



TEST IT!

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GENERALLY, ENVIRONMENTAL BENEFITS OF TRANSITIONING TO RENEWABLE ENERGY

Improved Air Quality
The replacement of fossil fuel-based energy generation by renewable sources helps reduce air pollution, thus improving public health. Reduced air pollution makes the air safer to breathe and can help prevent millions of deaths annually that are attributed to avoidable environmental causes.

Ecosystem Protection
Renewable energy helps in the reduction of the impact of climate change on ecosystems, with associated risks related to habitat loss, alteration of marine and terrestrial ecosystems, and rise in sea levels.

Water Conservation
Most renewable energy technologies have a minimal requirement for operation regarding water use, unlike many fossil fuel power plants.

Reduced Environmental Impact
Renewable energy projects can have fewer negative effects on the environment and wildlife compared to fossil fuel alternatives.

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SOME ACTIVITIES ABOUT RENEWABLE ENERGY

Through simple online games, you can play with your students while explaining the materials, their logic, and their functions step by step during the gameplay!

Here some examples:

Fidgit Power: https://pbskids.org/designsquad/games/fidgit_power/
Watts Trouble: https://pbskids.org/cyberchase/games/watts-trouble
Power Our Community: https://sustainable-earth.org/power-our-community/index.html

ELECTRIFYtoday Mobile Game: https://tech-education.com/electrify-today-en/
Megawatt Card Game: https://megawatt.game/

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IMPORTANCE OF SUSTAINABLE AGRICULTURE PRACTICES (1)

Climate Change Mitigation

- **Carbon Sequestration:** Practices such as no-till farming and cover cropping store carbon in the soil, potentially offsetting up to 12% of global greenhouse gas emissions.

- **Reduced Emissions:**
  - Using cover crops reduces up to 50% of CO2 emission.
  - Pasture-based beef production uses 50% less energy than feedlot systems.
  - Organic farming systems require 25% less energy than conventional systems.

https://unfccc.int/sites/default/files/resource/365_COMMIT%20Fact%20Sheet%20EU%20-%20a%20long-term%20low-emission%20pathway.pdf

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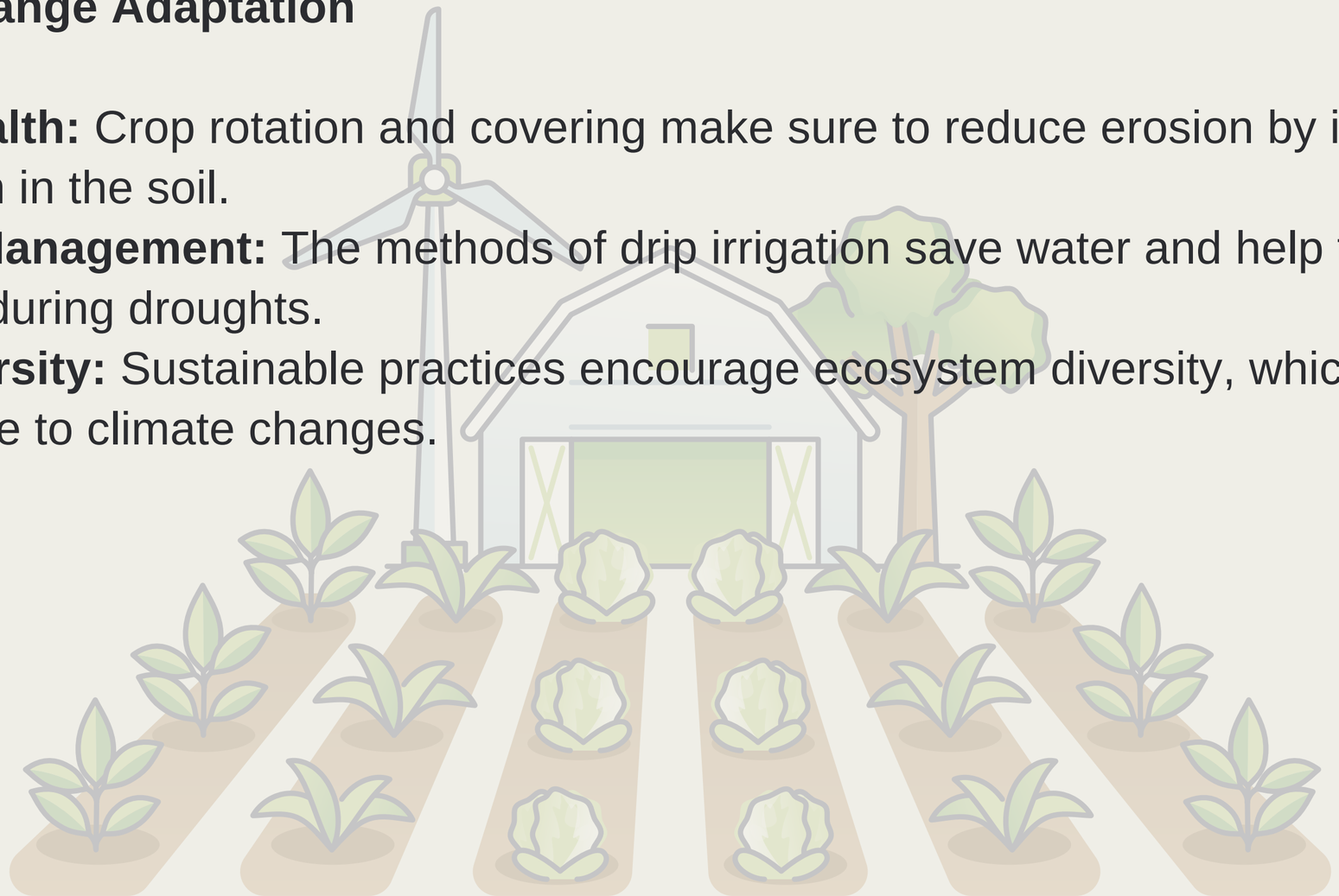
IMPORTANCE OF SUSTAINABLE AGRICULTURE PRACTICES (2)

Climate Change Adaptation

- **Soil Health:** Crop rotation and covering make sure to reduce erosion by increasing water retention in the soil.
- **Water Management:** The methods of drip irrigation save water and help the crops to survive during droughts.
- **Biodiversity:** Sustainable practices encourage ecosystem diversity, which helps improve resilience to climate changes.



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IMPORTANCE OF SUSTAINABLE AGRICULTURE PRACTICES (3)

Food Security

- **Crop Diversification:** Cultivate drought-tolerant, multi-crops to reduce vulnerabilities against extreme weather.
- **Increased Productivity:** Climate-smart methods meet the growing demand for food without expanding farmland.

Economic Benefits

- **Lower Costs:** Precision agriculture and water-saving techniques reduce spending on fertilizers, pesticides, and water.
- **Risk Reduction:** It assists farmers in adapting to changes through markets and environmental changes.

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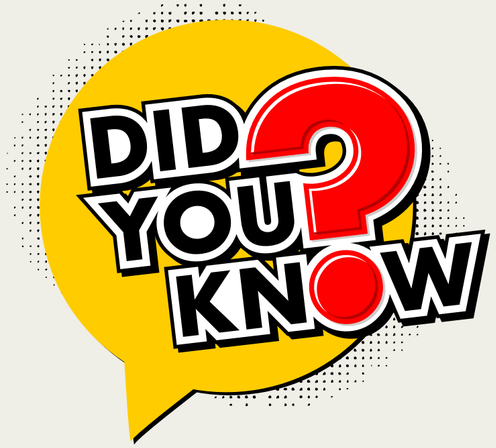

ABOUT THE VERTICAL FARMING? (1)

Vertical farming is an innovative agricultural method that involves growing crops in vertically stacked layers, typically in controlled indoor environments.

- **Vertical Arrangement:** Crops are grown in stacked layers, maximizing space utilization.
- **Indoor Environment:** Most vertical farms are located indoors, allowing for year-round cultivation.
- **Soilless Growing:** These systems generally employ hydroponic, aeroponic, or aquaponic methods.
- **Advanced Technology:** Vertical farms put to use advanced mechanisms in controlling the growth of crops and resources.

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ABOUT THE VERTICAL FARMING? (2)

Hydroponic:

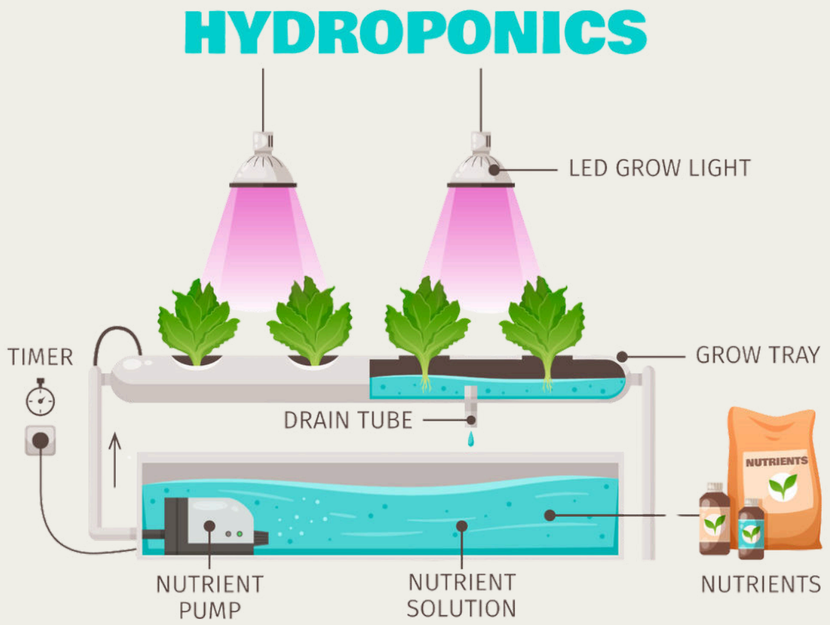
Plants grow in water and nutrients are added to the water.

Aeroponic:

Fish and plants are grown together; fish waste is a natural food source for the plants.

Aquaponic:

The plants are suspended in the air and their roots are sprayed with nutrients in the form of a fine mist.



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TEACHING VERTICAL FARMING WITH MINECRAFT

Minecraft is a very popular game among students. When used correctly, it can take on a STEM-oriented educational role. At this point, it is possible to create small vertical farms with the Minecraft game.

As a matter of fact, there are several best practice videos on this subject via Youtube:

Minecraft Tutorial : Wheat Carrot Potato Farm V2: https://www.youtube.com/watch?v=FuLBnF8V

[Minecraft Concepts] Vertical Crop Farm: https://www.youtube.com/watch?v=D86QLq4O8Sw

Vertical Farm [Wheat/Potato's/Carrots] "Tutorial": https://www.youtube.com/watch?v=cQjgN1Nvmyw

:

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URBAN PLANNING AND GREEN INFRASTRUCTURE SOLUTIONS

Urban planning is a multidisciplinary field that deals with the development and design of urban areas, amenable to functional, sustainable, and livable cities. It encompasses various facets of urban life, comprising land use, infrastructure, transportation, housing, public spaces, and environmental considerations.

Urban planning has evolved from a top-down approach to a more inclusive process that considers community needs and experiences. As cities face increasing challenges related to **population growth, climate change, and resource management**, effective urban planning becomes ever more critical in shaping sustainable, equitable, and livable urban environments for the future.

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not only for climate change!

- **Quality of Life:** It directly influences the living, working, and enjoyment of time in urban cities.
- **Economic Development:** It aids in accomplishing functional economic growth and business development.
- **Social Equity**: Urban planning has the power to facilitate inclusion by opening up opportunities to all citizens.
- **Healthy Lifestyle and Safety:** A well-planned city could improve citizens' health by having better sanitation, less pollution, and more green areas. It does this by ensuring the correct allocation of resources such as water, electricity, and transport networks.

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URBAN GARDENING

Urban gardening can be defined as *“urban farming”* or *“urban agriculture”* being the most common. Urban agriculture can be defined closely as **"the agriculture that happens to fall within or at the edge of a metropolitan area".**
Urban farming can be referred to as **"the practice of agriculture or aquaculture"**.
In the term "urban gardening", the word "garden" may refer to **"a plot of ground where herbs, fruits, flowers, or vegetables are cultivated"** or a container used for the same purpose.

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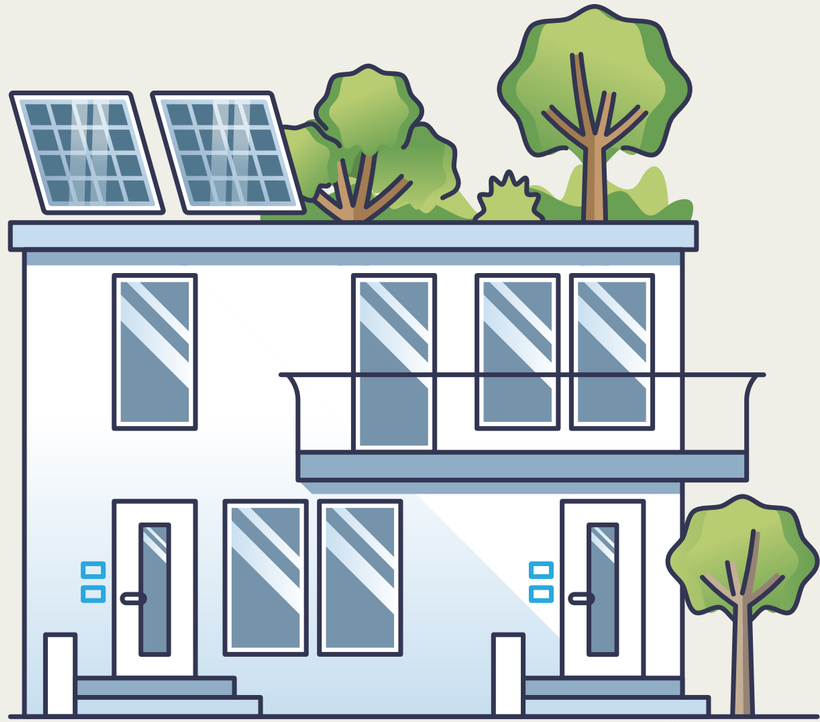
SO, FOR CLIMATE CHANGE...

- Urban gardening contributes to a reduction of the causes of climate change through **local production of food**, which **reduces transportation emissions, hence shrinking supply chains.**
- These gardens serve as carbon sinks, absorbing CO2 out of the atmosphere, while helping to **regulate urban temperatures** and **mitigate the urban heat island effect*.**
- Additionally, they help **improve air quality through pollutant filtering, enhance water management by increasing retention and reducing runoff**, and they support **biodiversity through habitat provisions for pollinators**.
- Besides, urban gardens contribute to **waste reduction by composting organic refuse** and can **minimize packaging needs through direct sales to consumers**.
- In sum, urban gardening nurtures both more sustainable urban environments and greater local food security.



* An urban heat island (UHI) is a metropolitan area that is significantly warmer than the surrounding rural areas due to human activities. The temperature difference between these metropolitan areas and the surrounding less dense areas can be up to 5 °C.

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URBAN GARDENING TECHNIQUES IN SCHOOL(1)

- You can put a container garden just about anywhere — a front stoop, along the edge of a driveway or walkway, even on a rooftop!
- Small containers are perfect for small crops like lettuce and herbs; tomatoes like larger pots, holding as much as 5 gallons.
- You can buy pots or make your own — just make sure there are holes in the bottom to let excess water drain. Most plants like full sun, but in hot climates a little midday shade can keep plants from drying out too quickly.
- If your containers are small enough and light enough, you can shift them into sunny spots during the day or even move them into a protected area if an unexpected cold snap threatens.

Here is super, fun, real-life best practice video which will be EXTREMELY helpful to you:
https://www.youtube.com/watch?v=SyQ13N9Qasg

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URBAN GARDENING TECHNIQUES IN SCHOOL(2)

- You can put flowers, herbs, small vegetables — there are even compact tomato varieties developed for hanging pots! Keep in mind that most plants need at least a half-day of full sun, so you'll have to be creative about where you place the pots. A pole or sturdy "shepherd's hook", the kind often used to hold bird feeders, works well.

- You can create huge wall garden made from milk (or something else) cartons and planted with herbs, fruits, and vegetables. Here is the best practice for this: https://www.youtube.com/watch?v=dHCnXwWUTzc

This is not something new! Here is another video related to school gardens from almost 15 years ago: https://www.youtube.com/watch?v=w49C-oF_hqo

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IMPACT OF TRANSPORTATION INNOVATIONS ON EMISSIONS

Transportation innovations are having a significant impact on reducing emissions!!

Specially, this shift to **electric vehicles** (EVs) is very important for reducing emissions, as they produce **zero tailpipe emissions.**

Some facts:

- The alternative to fossil fuels for cars, trucks, and even airplanes is biofuels, hydrogen, and synthetic fuels.
- These fuels will cut down the emissions where electric options are just not very practical.
- It increases public transit systems, reducing the number of cars on the road.
- Ride-sharing and carpooling maximize vehicle use while reducing unnecessary emissions.
- Providing cycle tracks and pedestrian-friendly spaces can incentivize active transportation, reducing vehicle-caused pollution for short trips.

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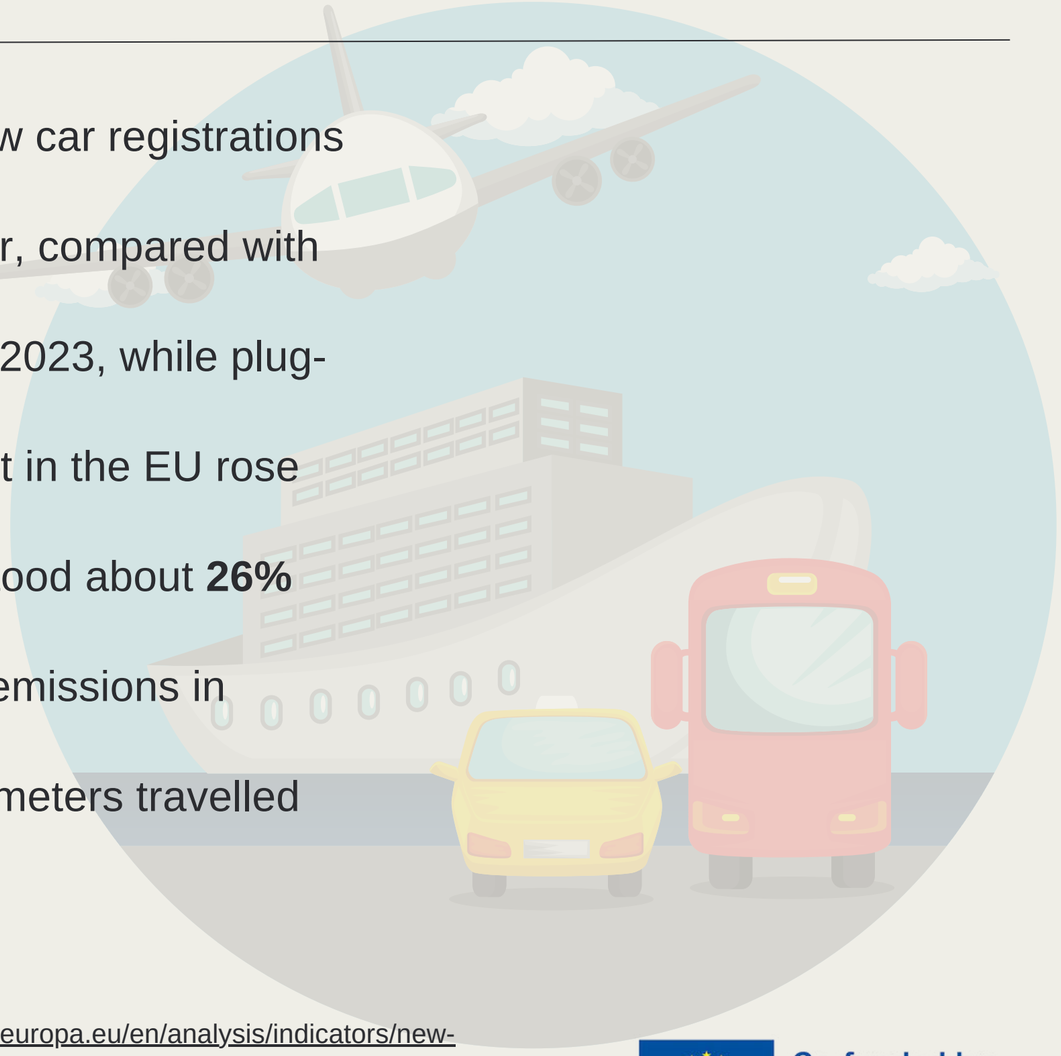
SOME STATISTICS FROM EU ABOUT TRANSPORTATION



- In 2023, battery electric vehicles accounted for **22.7%** of all new car registrations and **7.7%** of all new van registrations in the European Union.
- In total, **2.4 million new electric cars** were registered last year, compared with 2 million in 2022.
- New registrations for battery electric cars increased by **37%** in 2023, while plug-in hybrid car registrations declined almost 4%.
- The share of energy from renewable sources used for transport in the EU rose from under 2% in 2005 to **8.7% in 2022.**
- In 2022, greenhouse gas emissions from transport in the EU stood about **26%** above the level in 1990.
- Transport contributed about **29%** to the EU's greenhouse gas emissions in 2022.
- Cars accounted for nearly three quarters of the passenger-kilometers travelled in the EU in 2022, **73%.**

https://www.eea.europa.eu/en/topics/in-depth/transport-and-mobility; https://www.eea.europa.eu/en/analysis/indicators/new-registrations-of-electric-vehicles; https://www.eea.europa.eu/en/newsroom/news/transport-in-europe

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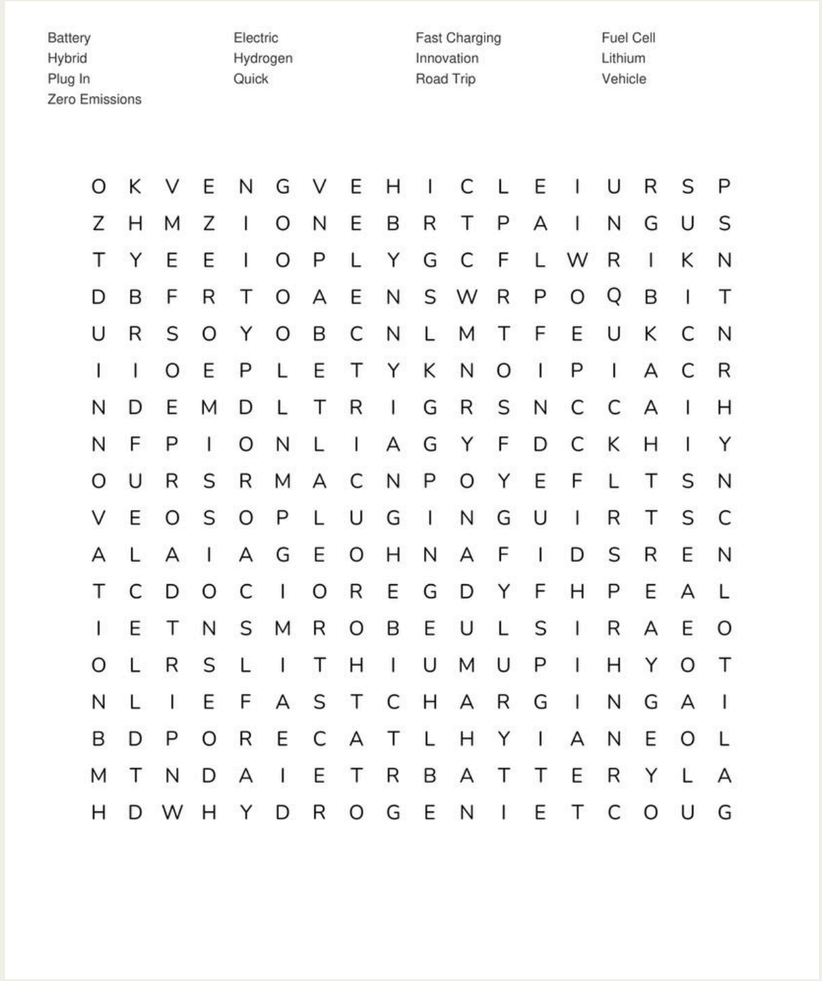
SOME ACTIVITIES ABOUT SUSTAINABLE TRANSPORTATION (1)



Battery
Hybrid
Plug In
Zero Emissions

Electric
Hydrogen
Quick

Fast Charging
Innovation
Road Trip

Fuel Cell
Lithium
Vehicle

O K V E N G V E H I C L E I U R S P
Z H M Z I O N E B R T P A I N G U S
T Y E E I O P L Y G C F L W R I K N
D B F R T O A E N S W R P O Q B I T
U R S O Y O B C N L M T F E U K C N
I I O E P L E T Y K N O I P I A C R
N D E M D L T R I G R S N C C A I H
N F P I O N L I A G Y F D C K H I Y
O U R S R M A C N P O Y E F L T S N
V E O S O P L U G I N G U I R T S C
A L A I A G E O H N A F I D S R E N
T C D O C I O R E G D Y F H P E A L
I E T N S M R O B E U L S I R A E O
O L R S L I T H I U M U P I H Y O T
N L I E F A S T C H A R G I N G A I
B D P O R E C A T L H Y I A N E O L
M T N D A I E T R B A T T E R Y L A
H D W H Y D R O G E N I E T C O U G

Some terms can be difficult for students to keep in mind!!!

For example, this word search welcomes students to identify important terms related to electric vehicles. Students will build vocabulary and grasp main concepts that provoke their curiosity of how electric vehicles can be used toward a greener, sustainable future.

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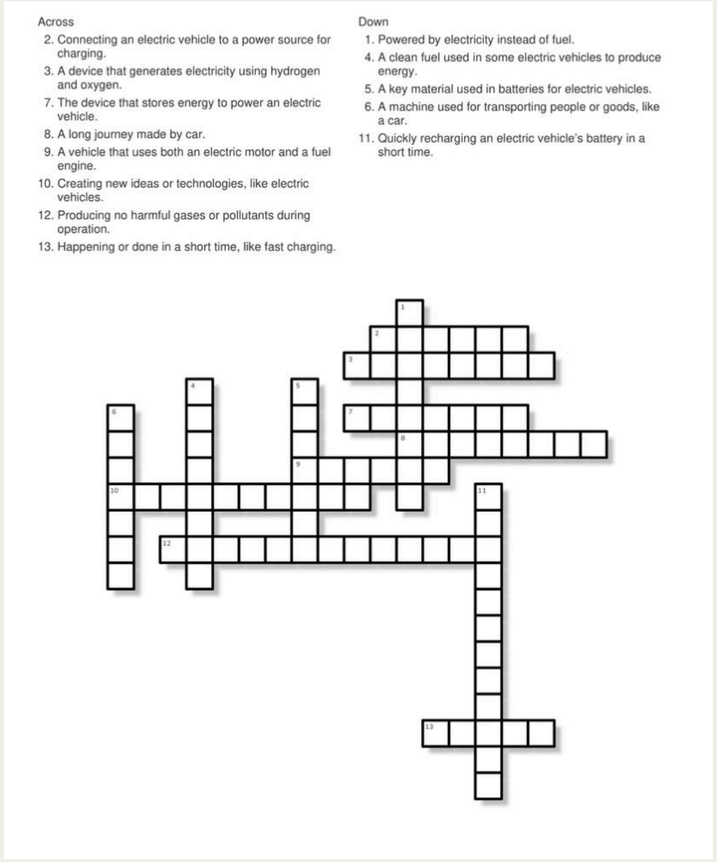
SOME ACTIVITIES ABOUT SUSTAINABLE TRANSPORTATION (2)

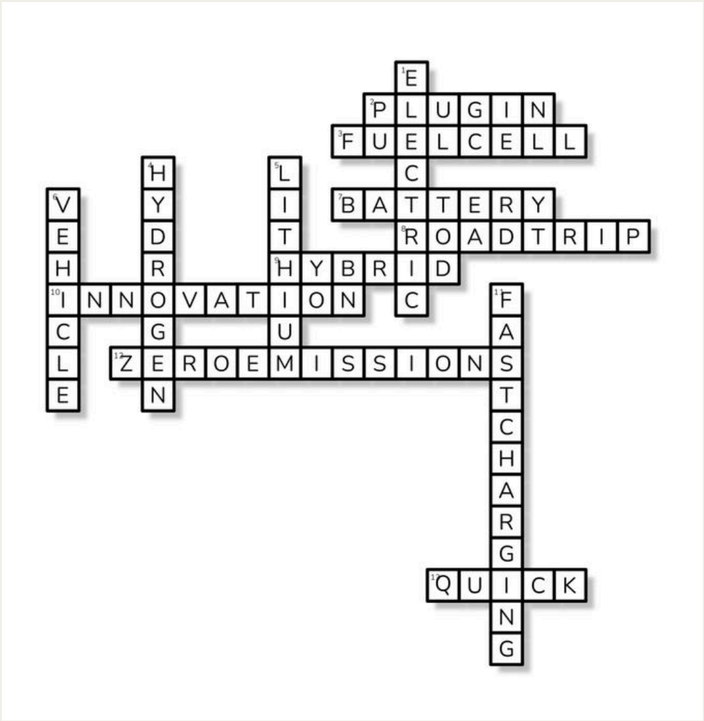
Across

2. Connecting an electric vehicle to a power source for charging.
3. A device that generates electricity using hydrogen and oxygen.
7. The device that stores energy to power an electric vehicle.
8. A long journey made by car.
9. A vehicle that uses both an electric motor and a fuel engine.
10. Creating new ideas or technologies, like electric vehicles.
12. Producing no harmful gases or pollutants during operation.
13. Happening or done in a short time, like fast charging.

Down

1. Powered by electricity instead of fuel.
4. A clean fuel used in some electric vehicles to produce energy.
5. A key material used in batteries for electric vehicles.
6. A machine used for transporting people or goods, like a car.
11. Quickly recharging an electric vehicle's battery in a short time.





You can create this puzzle, which you can also apply to students online, by projecting the screen with a smart board and answering the questions, through the ohmydots.com website.

WASTE MANAGEMENT AND CIRCULAR ECONOMY PRACTICES

Waste management is the collection, treatment, and proper disposal of waste to ensure the least environmental impact.

Waste management can give students a basis for making them understand how their daily activities destroy the environment and how waste may be managed in an eco-friendly manner.

Circular Economy Practices go one step further by redesigning the traditional **“take-make-dispose”** system. Instead of throwing things away after use, the circular economy focuses on keeping materials in use for as long as possible.

OPEN: WIDE MINDS WILL FIND ECO VIRTUAL STEAM SOLUTIONS TOWARDS CLIMATE
WI-MI

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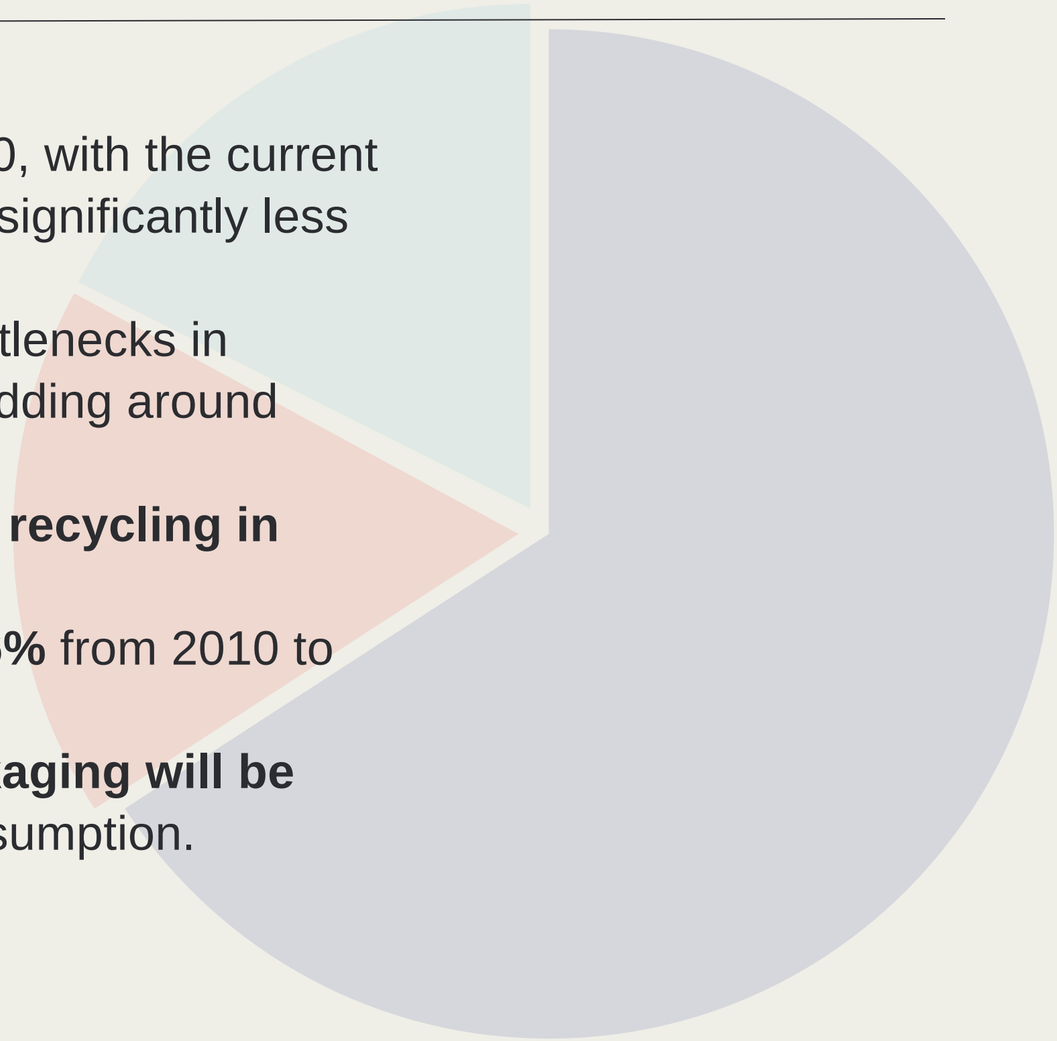
WHY IT IS IMPORTANT?

- The EU aims to double its use of recycled material by 2030, with the current rate being at **11.5%** of the material used in 2022, which is significantly less than what is desired.
- Employing ambitious circular economy, baselining and bottlenecks in Europe will raise EU's GDP by an extra 0.5% until 2030, adding around **700,000** new jobs.
- The EU has targets to reduce municipal waste by **55% for recycling in 2025 and by 65% in 2035.**
- The EU managed to reduce its landfill rate from **23% to 16%** from 2010 to 2020, decreasing waste sent to landfills by **27%**.
- The Commission's target is to ensure that **all plastic packaging will be recyclable** by 2030 and to reduce single-use plastics consumption.



https://www.eea.europa.eu/en/topics/in-depth/circular-economy;
https://www.interregeurope.eu/sites/default/files/inline/Policy_brief_on_waste_management.pdf,
https://www.europarl.europa.eu/topics/en/article/20151201STO05603/circular-economy-definition-importance-and-benefits

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SOME ACTIVITIES ABOUT WASTE MANAGEMENT (1)

Composting is seen as an activity that is simple to explain and comprehend to students among the waste management themed terms.

First Step: Introduction

- Explain what composting is and why it's important.
- Provide examples of compostable materials that might include fruit peels or coffee grounds and non-compostable items like plastic and metals.

Second Step: Set Up the Compost Bin

- Use a small container or bucket with a lid.
- Add in some "browns" to add carbon, such as dry leaves or shredded paper.
- Add in some "greens" for nitrogen; fruit scraps and vegetable peels work well.
- Lightly wet the mixture with water, but do not drown it.

Third Step: Turn and Observe 5 minutes per session

- Have the students take turns once a day or every week to mix the compost to give oxygen to the decomposition process.
- Discuss the breakdown of materials and monitor changes in smell, texture, and temperature.

Final Step: Harvest the Compost (After 4-8 weeks)

- Once the materials have broken down into dark crumbly compost, take it to plant seeds in or enrich the soil in a garden.
- Composting for plants and the environment can be highly beneficial.

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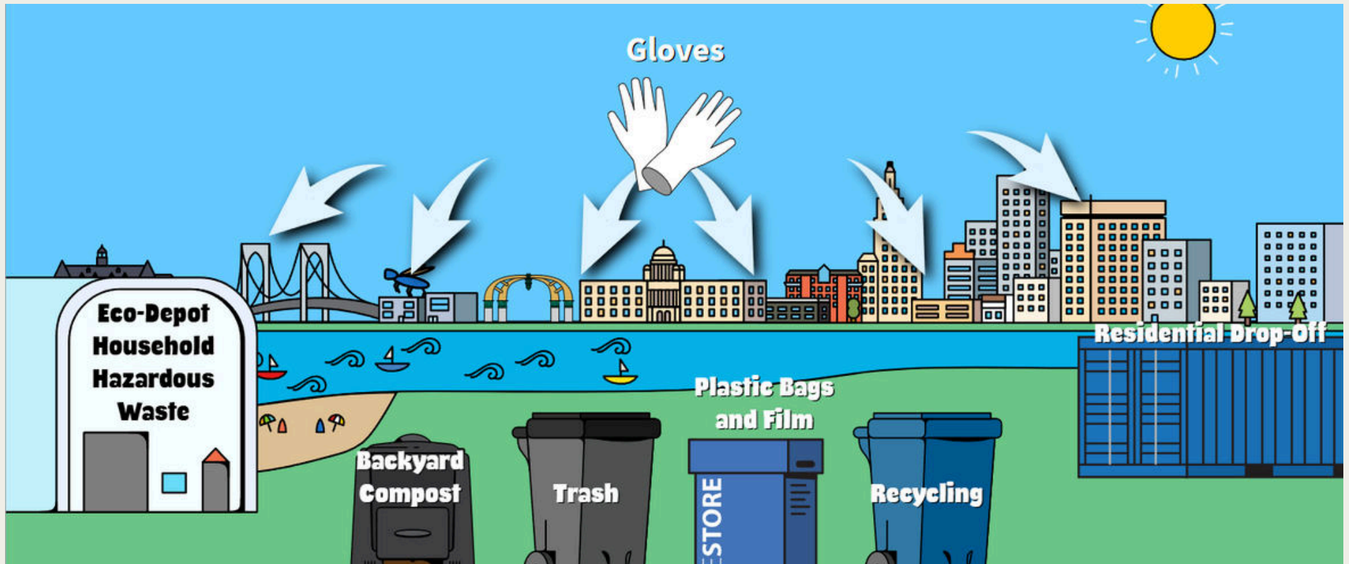
SOME ACTIVITIES ABOUT WASTE MANAGEMENT (2)

It is also true that interactions with computer attract students' attention and contribute greatly to learning when used correctly. At this point, some online games with the theme of waste management can be played individually or in the classroom environment under the presentation of the teacher:

Some examples:
Ready, Set, Sort! Game: https://rhodeislandresource.recycle.game/
Recycling for Kids: https://www.turtlediary.com/game/recycling-waste.html
Recycle Round Up: https://kids.nationalgeographic.com/games/action-adventure/article/recycle-roundup-new
Recycle City: https://www3.epa.gov/recyclecity/mainmap.htm
Case of the Broken Loop: https://www.epa.gov/sites/default/files/2015-09/documents/4-6.pdf



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CREATING CLIMATE CHANGE FOCUSED STORIES WITH ARTIFICIAL INTELLIGENCE (1)

Activities such as story-telling can be used as good learning materials because they consist of introduction, development, conclusion and can contain interesting elements for students. In this respect, it is possible to use **“artificial intelligence”** effectively!

ChatGPT can be used as a unique resource in this respect.

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CREATING CLIMATE CHANGE FOCUSED STORIES WITH ARTIFICIAL INTELLIGENCE (2)

By giving ChatGPT the necessary prompts, we can ask it to create an interesting story. If we are a little “detailed” in this regard, we will get more effective stories.
You can even ask ChatGPT to prepare this prompt by specifying what you really want!

For example:
Write a story for 11-13-year-old students about a **12-year-old protagonist** who notices **strange changes** in their local environment, such as disappearing insects, wilting plants, or fewer animals in their neighborhood. With the help of a mentor, such as a teacher or environmental expert, they discover that these changes are caused by **climate change** and its effects on **biodiversity**. As the protagonist learns about the importance of biodiversity and the challenges posed by climate change, they are inspired to take action. The story should be engaging and educational, explaining biodiversity and climate change in **simple, relatable terms**. The tone should **balance the seriousness of the issue with hope** and empowerment, encouraging students to feel that their actions can make a positive impact in preserving the natural world.

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CREATING CLIMATE CHANGE FOCUSED STORIES WITH ARTIFICIAL INTELLIGENCE (3)

Full version of example story named The Missing Bees and the Vanishing Green:

https://docs.google.com/document/d/1J71814dQtYF_mPRROsC5ABCMSSSuYRaiFfk8g_wghoE/edit?usp=sharing

You can also **visualise** this story with the help of artificial intelligence (ChatGPT, Canva etc.)!
For example:

THANK YOU!

ANY QUESTIONS?

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