



Renewable Energy Coding Project

STEM4inclusive schools
WP2 – Toolbox



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Structure of the activity

A Introduction

about the topic

What are renewable energy sources?
How to start coding?

B Training phase

about the training

Learn the basics of coding using Scratch or Python.
Design a simulation or game incorporating renewable energy concepts.
Develop problem-solving and creative thinking skills.





A: About the topic

What are renewable energy sources?
How to start coding?

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What are renewable energy sources?

1. Solar Energy:

- Captures sunlight and converts it into electricity.
- Example: Solar panels on rooftops or solar farms.

2. Wind Energy:

- Uses wind turbines to generate power.
- Example: Offshore and onshore wind farms.

3. Hydro Energy:

- Converts moving water into electricity.
- Example: Hydroelectric dams and tidal energy.





Importance of Renewable Energy

- Reduces reliance on fossil fuels.
- Minimizes greenhouse gas emissions.
- Supports sustainable development and energy independence.

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Coding Basics

- **What is Coding?**

Writing instructions for computers to execute tasks.

- **Key Concepts:**

Loops: Repeat actions efficiently.

Conditionals: Make decisions in programs.

Variables: Store and manipulate data.





Platforms for the Project

- **Scratch:**

Block-based programming, ideal for beginners.
Interactive and visual design tools.

- **Python:**

Text-based programming for advanced users.
Flexibility to create complex simulations.



How to start coding with Python?

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Let's have a look at this
YouTube video!



```
1 # variable = A reusable container for a value (string, integer, float, boolean)
2 # The variable behaves as if it was the value that it contains
3
4 full_name = "Bro Code"
5 age = 25
6
7 print(f"Hello {full_name}")
8 print(f"You are {age} years old")
```

A. Introduction
B. Variables
C. Arithmetic

Hello Bro Code
You are 25 years old

Process finished with exit code 0

<https://www.youtube.com/watch?v=Sg4GMVMdOPo>

Let's have a look at this
YouTube video!



Beginners Guide to Scratch



https://www.youtube.com/watch?v=zOa5o9Yq_ZU

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How Renewable Energy Meets Coding

1. Simulations:

- Model how solar panels generate energy.
- Visualize wind turbines converting kinetic energy into electricity.

2. Games:

- Create challenges requiring players to balance energy sources.
- Design characters powered by renewable energy.



*Let's learn more about
renewable energy
sources*

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Solar Energy Technologies and Global Impact

How Solar Panels Work:

Photovoltaic cells convert sunlight into electricity.

Examples: Rooftop solar panels, solar farms.

Benefits:

Clean, renewable, and abundant energy source.

Reduces carbon footprint and dependency on fossil fuels.

Challenges:

High initial cost and efficiency variability depending on sunlight.

Recycling and disposal of old solar panels.





Wind Energy: Advantages and Challenges

How Wind Turbines Work:

Turbines convert kinetic energy from wind into electricity.

Types: Onshore and offshore wind farms.

Advantages:

One of the cheapest renewable energy sources.

Can be deployed in remote and rural areas.

Challenges:

Impact on bird and bat populations.

Noise and aesthetic concerns.





Hydropower and Its Environmental Implications

How Hydroelectric Dams Work:

Water flows through turbines, generating electricity.
Includes tidal and wave energy systems.

Benefits:

Reliable and efficient energy source.
Provides flood control and water storage.

Environmental Impact:

Alters ecosystems and affects fish migration.
Potential displacement of communities near dam sites.



Innovations in Renewable Energy Systems

- Floating solar farms on reservoirs and lakes.
- Vertical-axis wind turbines for urban environments.
- Ocean thermal energy conversion (OTEC) in tropical regions.
- Smart grids integrating renewable energy with traditional systems.



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The Role of AI in Renewable Energy

- Predicting energy demand using machine learning.
- Optimizing solar panel placement with AI algorithms.
- Managing energy grids efficiently through predictive analytics.





Future Trends in Technology and Energy

- Integration of AI with renewable energy systems.
- Development of energy storage solutions, like advanced batteries.
- Expansion of decentralized energy systems, such as microgrids.
- Innovations in biogas and biofuel production.

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And... More about coding!

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Scratch: Tips and Tricks for Beginners

- Use pre-built templates to speed up development.
- Break the project into smaller, manageable tasks.
- Experiment with sprites, backdrops, and sound effects.





Python: Building Blocks for Advanced Projects

- Focus on key libraries like Pygame for game development.
- Use loops and conditionals for interactive elements.
- Debugging tools to identify and fix errors.

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Debugging and Problem-Solving Strategies

Common Errors: Missing syntax, incorrect logic, infinite loops.

Solutions:

- Test code in small segments.
- Use print statements to track variable values.
- Collaborate with peers for fresh perspectives.





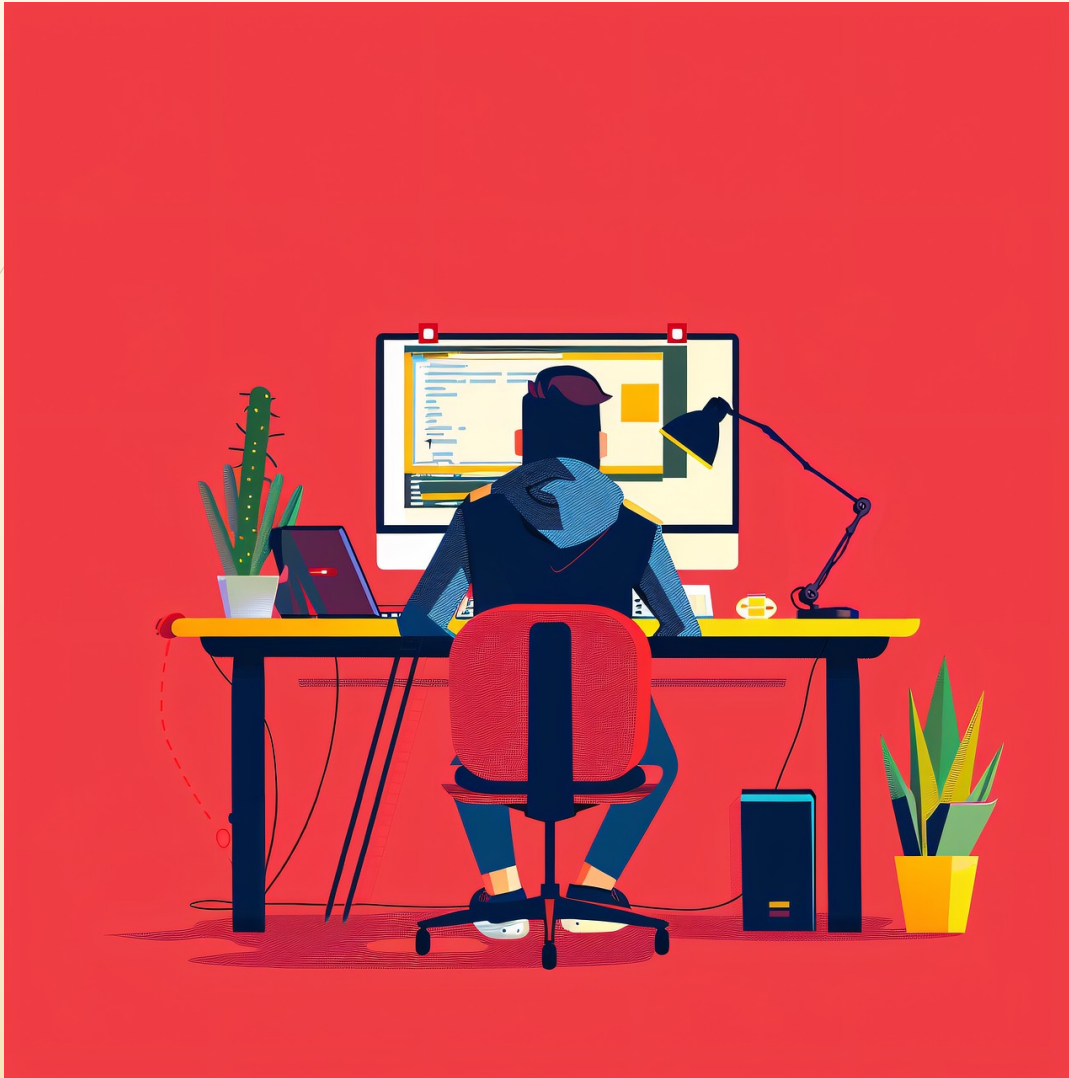
Creating Interactive Simulations

- Add user input to make the simulation engaging.
- Use animations to demonstrate energy flow in systems.
- Include score tracking for educational games.





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1. Draw a flowchart outlining the project structure.

2. Define the goal and main features of the project.

3. Assign roles and responsibilities within the group.



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Common Mistakes in Coding and How to Avoid Them

- Forgetting to save progress regularly.
- Overcomplicating the code without testing basic functionality.
- Ignoring user experience (UX) in game design.





Benefits of Integrating Coding with Sustainability Education

1. Enhances problem-solving and critical thinking.
2. Fosters collaboration and teamwork.
3. Prepares students for careers in tech and sustainability.

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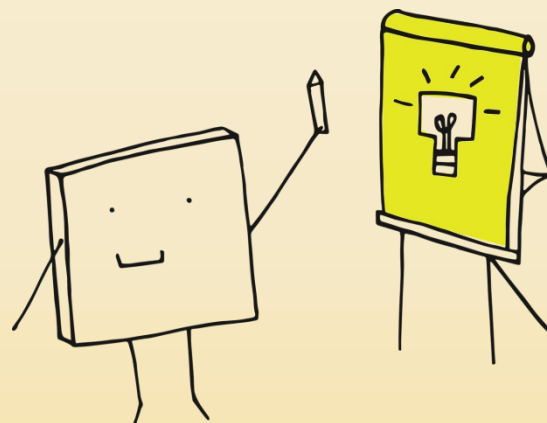
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B: Renewable Energy Coding Project



Training phase

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Your task:

- Start programming renewable energy simulations or games.
- You have 6 days.
- Work in groups and show the results to the others.



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DAY 1

1. Discuss the importance of renewable energy (solar, wind, hydro) for sustainability.
2. Discover examples of real-world applications of renewable energy.
3. Learn coding concepts relevant to the project (e.g., loops, conditionals, variables).
4. Discover basic functionality in Scratch or Python, such as creating sprites or using simple commands.
5. Brainstorm ideas for their simulation or game, focusing on integrating renewable energy themes

DAY 2-3

1. Explore examples of coding projects involving renewable energy.
2. Identify key elements to include in your projects.
3. Outline your project goals and draw a basic storyboard or flowchart.
4. Using Scratch or Python, begin programming your simulations or games.
5. Incorporate renewable energy elements, such as characters powered by solar panels or challenges solved using wind energy.
6. Share your progress and receive constructive feedback.

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DAY 4-5

1. Debug your code and refine your project for smooth functionality.
2. Prepare a presentation showcasing your project, including:
 - The renewable energy concept integrated.
 - How coding was used to bring the idea to life.
 - Challenges faced and solutions implemented.

DAY 6

1. Present your project to the class, demonstrating the simulation or game.
2. Take part in a class-wide discussion on the creativity and feasibility of the projects.
3. Reflect on the importance of combining coding with sustainability concepts.

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H5P- Tasks:

I had a problem with preparing H5P... Could you please help me? I prepared the content...



Drag the Words – Renewable Energy Sources

Match the type of renewable energy with its description:

1. Solar Energy – Captures sunlight to generate electricity.
2. Wind Energy – Uses wind turbines to convert wind into power.
3. Hydro Energy – Generates electricity from moving water.

Quiz – Coding and Renewable Energy

1. What is a benefit of using loops in coding?

- a) **Saves time and reduces repetitive tasks.**
- b) Makes the code harder to understand.
- c) Increases memory usage.

2. Which renewable energy source would be best for a location with constant sunlight?

- a) Wind Energy
- b) Hydro Energy
- c) **Solar Energy**

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Congratulation!

You mastered the activity on Renewable Energy Coding Project!

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