Railways

Design a Sustainable Railway System

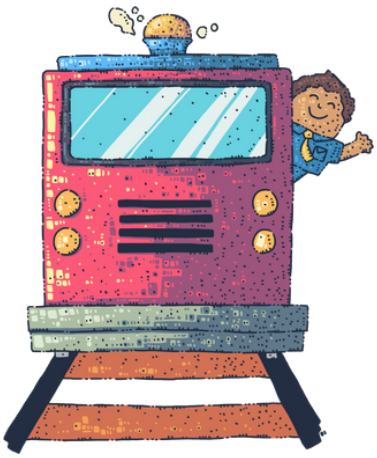
Keywords:

sustainability, transportation, railway, environment, renewable energy

Target group:

primary school pupils (ages 6-11)

Objectives:



This activity introduces pupils to the concept of sustainable transportation through the design of an eco-friendly railway system. Pupils will explore how trains can reduce environmental impact by using renewable energy and thoughtful design. Through collaborative model building and creative thinking, they will learn about the environmental benefits of railways, understand how to integrate sustainable features into transportation systems, and reflect on how public transport can support greener cities and communities.

General Guideline on Time Allocation:

The duration needed to carry out this activity may vary depending on the specific group of children. Teachers are encouraged to adapt the implementation according to the needs, interests, and dynamics of the group.

In the preparatory phase, teachers may use a variety of activities to introduce and contextualize the chosen topic. These can include discussions, videos, drawings, storytelling, or even a field trip, depending on the age and background knowledge of the children.

The main construction phase, during which children plan and build their urban element using LEGO bricks, should typically not exceed 45 to 60 minutes. However, this phase often stimulates further curiosity and questions among the children, potentially leading to extended engagement or follow-up activities. For more detailed instructions and pedagogical support on how to implement activities of INNO–kids project, please download the Teacher's Methodological Guide.

Materials and Resources Needed:

- Cardboard boxes or rolls (for building train structures and tracks)
- Construction paper and markers (for decorating, signage, and labels)
- Recycled materials such as plastic bottles, egg cartons, and cardboard (for creative design elements)
- LEGO bricks or other types of building blocks (optional, for modeling trains and infrastructure)
- Pictures or diagrams of trains, solar panels, wind turbines, and green landscapes (as visual aids and inspiration)
- Scissors, glue, crayons, and other craft supplies (for assembly and visual detailing)

Note: Encourage pupils to repurpose available materials creatively. If building blocks are not available, pupils can draw and build their railway designs using simple paper-based or handmade components.

Introduction:

Begin the activity by introducing various modes of transportation and their impact on the environment. Highlight how trains, as a form of public transport, can carry many people at once and are often more energy-efficient.

Procedure:

Preparation:

Divide pupils into small groups of three to four members. Begin by introducing the concept of sustainability in transportation, focusing on how traditional transport systems contribute to pollution, habitat loss, and greenhouse gas emissions.

Discuss how railways can offer a cleaner alternative, especially when powered by renewable energy. Present examples of sustainable railway systems that use solar panels, wind energy, or electric trains integrated.

Encourage pupils to think critically about what makes a railway system environmentally friendly. Support this with visual prompts (e.g. photos of green trains, renewable energy sources, wildlife-friendly railway corridors, low-noise tracks and green buffers).

Construction:

- Provide each group with the necessary materials to build their model railway system. Begin with a group brainstorming session to identify key features their railway should include .
- Encourage pupils to think not only about how the railway operates, but also how it affects the surrounding environment.

Details:

- Encourage pupils to reflect on how their railway system minimises environmental impact while remaining efficient and user-friendly. Discuss how renewable energy sources, such as solar or wind power, can be used to operate trains and stations.
- Introduce the concept of noise reduction using sound barriers, and explore how the railway can be designed to protect ecosystems through wildlife crossings and elevated tracks or tunnels that reduce landscape fragmentation.
- Support pupils in thinking about passenger comfort as well—for example, including shaded waiting areas, safe platforms, and smooth connections to other forms of transport.

Stories:

- Invite pupils to imagine they are passengers on the sustainable railway system they designed. Ask them to describe their journey—what they see through the windows, how the train is powered, and how the environment looks.
- Pupils can also take on different roles—such as train conductors, engineers, or animals using a safe crossing—and explain how the railway benefits both people and nature.

Presentation:

- Invite each group to present their sustainable railway model to the class. Pupils should explain the key features of their design, including how it reduces environmental impact, supports wildlife, and improves the travel experience for passengers.
- Allow time for questions and feedback from classmates to promote peer learning and encourage respectful discussion of different approaches.

Tips:

- Encourage pupils to think critically about the challenges involved in building sustainable railway systems and to find creative solutions.
- Share real-world examples of innovative rail projects that use renewable energy, reduce noise, or support wildlife migration.
- Remind pupils to consider both environmental and human needs—balancing nature protection with comfort and accessibility for passengers.

Additional Considerations:

Differentiation:

Provide additional support or simplified instructions for pupils who may require extra assistance. For advanced pupils, offer extension tasks such as researching further sustainable practices or designing more complex models.

Assessment:

Assess pupils based on their participation and engagement during discussions and hands-on activities. Evaluate the creativity, effort, collaboration, depth of understanding demonstrated in their models, critical thinking, ability to provide constructive feedback and presentation skills.

Extension Activities:

- Encourage pupils to research real-world railway innovations such as high-speed trains, maglev technology, or zero-emission transit systems.
- Organise a class visit to a local train station or invite a transportation expert to discuss sustainable mobility.

Curriculum Connections:

This activity integrates:
Science *(energy, environment, ecosystems, renewable energy sources)*
Social Studies *(geography, transportation, urban planning)*
Art *(design, creativity, spatial reasoning skills)*
Language *(oral communication, storytelling, and listening skills)*

SDG Connections:

- **SDG 7:** Affordable and Clean Energy – Pupils explore how renewable energy can power sustainable transportation systems.
- **SDG 9:** Industry, Innovation, and Infrastructure – The activity promotes the design of forward-thinking and environmentally responsible railway systems.
- **SDG 11:** Sustainable Cities and Communities – Pupils learn how eco-friendly railways can reduce urban congestion and improve quality of life.
- **SDG 13:** Climate Action – The activity encourages low-emission transportation solutions to help reduce greenhouse gas emissions.

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