

Steps to Reduce Your Carbon Footprint in Transport

Educational Activity with the Use of ICT Tools and Augmented Reality (AR)

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The content is based on the Traditional Educational Material (TEM)

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IN A NUTSHEL



Overview

Students estimate the carbon footprint of their usual means of transport for their journeys between home and school, using ICT tools and Augmented Reality (AR) applications to visualize and analyze the impact. They evaluate whether it is possible for them to change their habits to reduce their carbon footprint.



9+ years old



By the end of this activity, students will be able to:

- Know how to compare the carbon footprint of different means of transport.
- Know that they can act for the climate through their personal choices



Geology/Earth Sciences, Biology/Science, STEAM, AR/ICT



2 class hours (classroom setting)

4 hours (outdoor setting)



Teacher Preparation:

Prepare ICT tools (PC/ tablet, projector, Wi-Fi, interactive board, AR apps)

Set up the classroom for group work

Familiarize yourself with the ICT software, including datasheets and links

Print the live poster in color and high resolution

Test one QR code and marker in advance to check if everything loads

Review all materials and worksheets

Prepare guiding questions and feedback prompts



Teaching Methods

Inquiry-Based Learning (Students explore concepts through questioning, experimentation, and data analysis).

Visual learning (Students use of diagrams, AR visuals, simulations, and posters to support understanding)

Collaborative Learning (Students work in pairs or small groups to complete tasks and discuss findings)

Technology enhanced learning (ICT tools, AR apps, simulations, Spreadsheets, and online data platforms)



Materials / equipment

PC/laptop, Video projector/screen, Wi-Fi, Interactive board

Smartphone/tablet, AR app

Poster with image markers and QR codes

Worksheet and Pens

STEP BY STEP

Steps to Reduce Your Carbon Footprint in Transport

Part A: Learning Activities in the Classroom Setting

1st Phase: Activation / Prior Knowledge Investigation

Activity goal: Use the Climate TRACE interactive map and data to make visible, concrete, and real the often-abstract concept of greenhouse gas emissions by sector and source.

Setting: Classroom (In-Class)

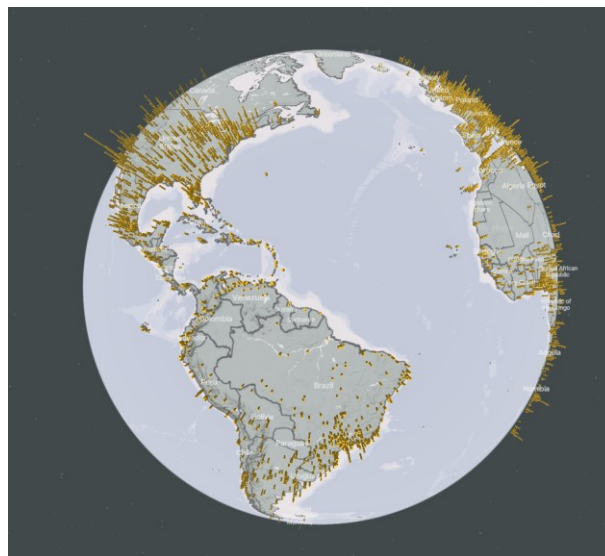
Estimated duration: 20 minutes

Mode of Student Work: Individual thinking and whole-class work

Instructions for the teacher:

Open the [Climate TRACE interactive map](https://climatetrace.org/explore#admin=&gas=co2e&year=2024&timeframe=100§or=transportation&asset) on a projector/interactive board: Select the **transportation sector** layer.

Zoom in on your country or a relevant region. Optionally, identify one or two “hotspot” sources (like major highways, airports, or ports) that students might recognize.



(<https://climatetrace.org/explore#admin=&gas=co2e&year=2024&timeframe=100§or=transportation&asset>)

Ask students to observe the map and data. Encourage them to:

- Ask questions about what they see.
- Make observations and form hypotheses.
- Connect the data to their own lives, especially their transportation habits).

Bring the class together. Distribute [Worksheet 1](#). Ask students record how they travel to school, including transport mode, distance, time, and whether it is eco-friendly.

Instructions for Each Column Record Table:

Student Name: Write your full name.

Mode of Transport: Select how you usually travel to school from the drop-down list:

 Car,  Bus,  Bike,  Walk, Other (if not listed, you can type it in)

Distance: Estimate the distance from your home to school in kilometers (km).

Estimated Time: Write how many minutes it usually takes you to get to school using your chosen transport mode.

Is it eco-friendly? From the drop-down list, select:

☒ Yes, if your transport method has low or zero carbon emissions (e.g., walking, biking, and public bus).

☐ No, if your transport method produces high emissions (e.g., traveling alone by car)

Students discuss their findings. Reflect on how their transportation choices relate to emissions data. Ask students:

- What is one advantage of your transport choice for the environment?
- What is one disadvantage of your transport choice for the environment?

The TEM material explains that: «A carbon footprint is the total amount of greenhouse gases (GHGs) generated by human activities (electricity production; heating; transport; food, etc). This amount is useful to reckon the impact of various activities on climate».

2nd Phase: Exploration

Activity goal: Analyze global and national emission trends by sector, and reflect on personal choices to reduce transportation-related emissions

Setting: Classroom (In-Class)

Estimated duration: 30 minutes

Mode of Student Work: Students work in groups to complete the task collaboratively, whole-class discussion

Instructions for the teacher:

Explain that students will explore real-world [Data Catalog - Our World](#) on greenhouse gases emissions using interactive graphs and tables.

Display the following graph on the interactive board: Greenhouse Gas Emissions by Sector – Our World in Data <https://ourworldindata.org/grapher/ghg-emissions-by-sector>.

Distribute [Worksheet 2](#). Guide students to:

- Zoom in on specific sectors
- Tap on data points
- Switch between years and countries

Ask students to work in groups and discuss their observations. Have them answer **Questions 1 and 2** on **Worksheet 2** based on what they see.

Display on the project/interactive board the below greenhouse gases emissions table ([EDGAR - The Emissions Database for Global Atmospheric Research](#)).

Ask students to compare emissions, identify trends. Have them answer **Questions 3 and 4** on **Worksheet 2** based on what they observe.

The TEM material explains that: «In France, transportation is the most impacting activity as it represented 31 % of the generated greenhouse gases in 2019. Unfortunately, emissions continue to increase today, mainly due to the burning of fossil fuels».

Greenhouse Gases Emissions Table

Year	GHG emissions Mt CO ₂ eq/yr	GHG emissions per capita t CO ₂ eq/cap/yr	GHG emissions per unit of GDP PPP t CO ₂ eq/kUSD/yr	Population
2023	0.989	3.422	0.201	289.000k
2015	0.912	3.211	0.195	284.217k
2005	0.867	3.166	0.188	274.009k
1990	0.860	3.303	0.222	260.374k

		2023 vs 1990	2023 vs 2005	2023 vs 2022
	Power Industry	 +31%	 +14%	 +5%
	Industrial Combustion and Processes	 +14%	 -7%	 +2%
	Buildings	 -1%	 +95%	 +5%
	Transport	 +73%	 +56%	 +7%
	Fuel Exploitation	 -78%	 -79%	 -5%
	Agriculture	 -44%	 +1%	 +1%
	Waste	 -7%	 -2%	 0%
	All sectors	 +15%	 +14%	 +4%

https://edgar.jrc.ec.europa.eu/report_2024

3rd Phase: Concept Introduction / Explanation

Activity goal: Enable students to compare carbon dioxide emissions from different modes of transportation and propose more sustainable alternatives.

Setting: Classroom (In-Class)

Estimated duration: 25 minutes

Mode of Student Work: Students work in groups to complete the task collaboratively, whole-class discussion

Instructions for the teacher:

Give each student group a **Poster** that includes four (4) marker images with QR codes.

Each QR code links to an AR object representing a different mode of transportation.

Ask students to scan the QR codes on:

Marker Image 1

Marker Image 2

Marker Image 3

Marker Image 4

Students should explore the CO₂ emissions associated with each transport mode.

Distribute [Worksheet 3](#).

Students work in groups to fill out Worksheet 3, comparing how much CO₂ is emitted when traveling 10 kilometers using each transport type. In particular, students are asked to choose the route with the lowest possible carbon footprint to reach school, taking into account the distance, mode of transportation, and CO₂ emissions. Through this process, they are encouraged to justify their choices and recognize the environmental impact of their daily commuting habits

Once students have completed the worksheet, ask them to share their answers and discuss the choices in daily travel that affect the environment, and discuss ways to reduce their carbon footprint.

Ask Students to work in small groups to rank transport modes from highest to lowest emissions. Discuss why some modes are more sustainable than others are. Encourage them to share observations in their groups and clarify the following questions:

- *What transport mode do you usually use to get to school? How does it compare in emissions?*
- *What small change in your daily travel could reduce your carbon footprint the most?*

Bring the class together to share key findings.

The TEM material concludes that: «By opting for a soft means of transport (cycling/walking) I can highly reduce my carbon footprint which limits my impact on global warming.”“The construction of an electric car represents twice more CO₂ emissions than an ICE car».

4th Phase: Analyze experimental data (Application/Elaboration)

Activity goal: Students present the results of their research and propose sustainable solutions based on estimated CO₂ emissions from different travel modes

Setting: Classroom (In-Class)

Estimated duration: 15 minutes

Mode of Student Work: Students work in small groups to complete the task collaboratively

Whole-Class Discussion

Instructions for the teacher:

Display the following simulation on the interactive board:

<https://agirpourlatransition.ademe.fr/particuliers/bureau/deplacements/calculer-emissions-carbone-trajets>

Ask students to use the simulation to estimate CO₂ emissions for different travel modes (bike, car, train, plane) based on distance traveled or the specified route:

Encourage them to share observations in their groups and clarify the following questions:

- *If everyone in your town/village switched from cars to bikes or buses, what impact would that have on total emissions??*

https://www.youtube.com/watch?v=8q7_aV8eLUE&t=1s

The TEM material explains that: «I have succeeded if I have compared CO₂ emissions, quoted values, calculated relations, and concluded with the best option».

5nd Phase: Exploring and Reflecting Data

Activity goal: Students apply the concepts learned during previous activities to design and build their own digital AR elements using Blippar.

Setting: Classroom (In-Class)

Estimated duration: 45 minutes

Mode of Student Work: Students work in small groups to complete the task collaboratively

Whole-Class Discussion

Instructions for the teacher:

Explain students they will create their own interactive Blippar AR experience.

They will integrate text, images, videos, or other multimedia elements to communicate a concept related to Carbon footprint or sustainable transport

Encourage students' creativity and relevance to their own lives or community.

Ask each group to design a **poster background** that will serve as the AR marker.

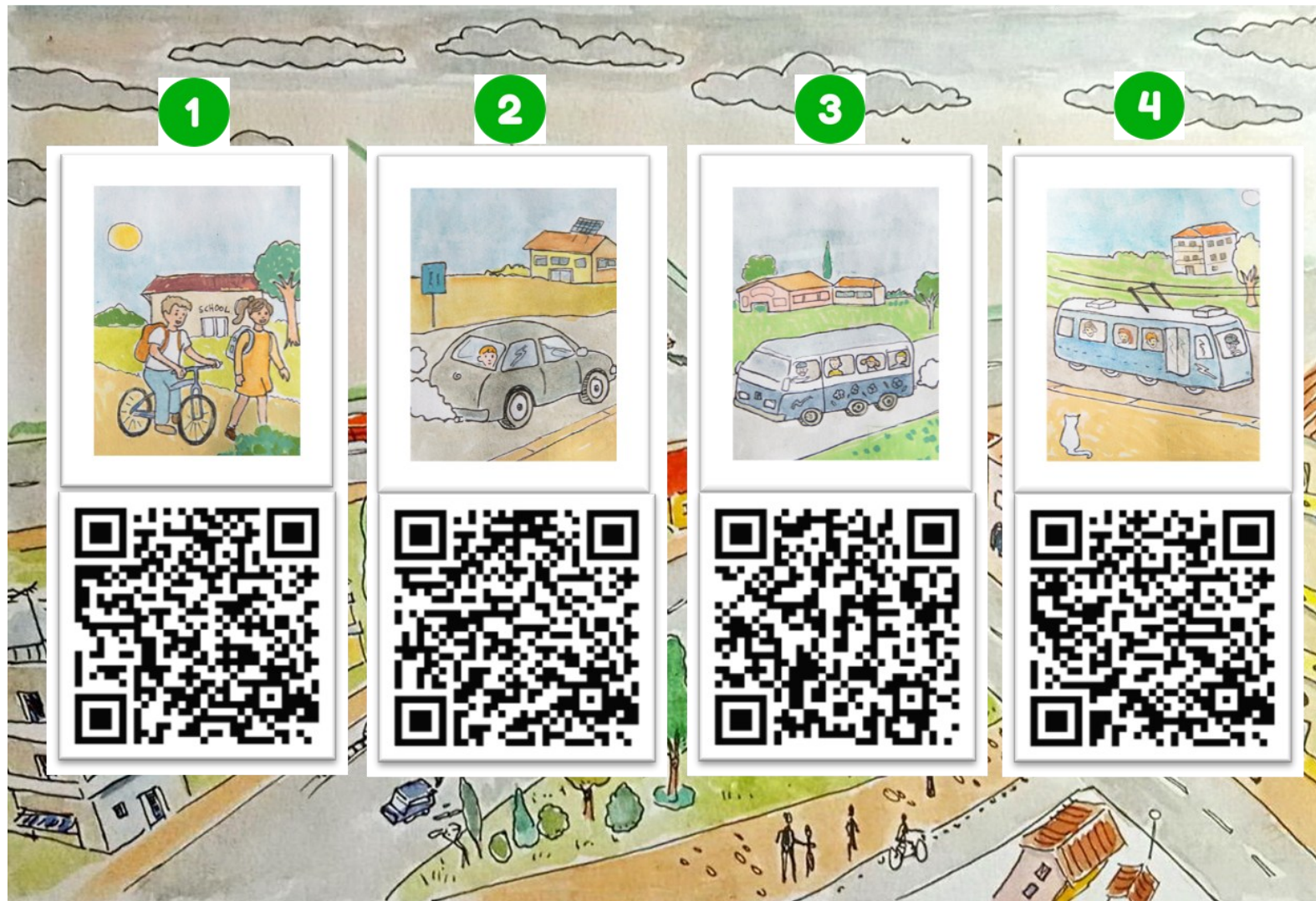
Guide groups to present their Blippar creations to the class.

Facilitate a whole class discussion:

- What message does each AR experience convey?
- How effectively does it communicate the concept?
- What improvements or additions could enhance the experience?

The TEM material suggests that: Did you know that there are many school carpooling apps where parents share their children's rides? Suggestion for integrating Augmented Reality tools: create a gaming app where users choose the least carbon-emitting journey."

Poster



Worksheet 1

Whole Class

[illegible]

Worksheet 2

Group Name: _____



After exploring, the graph write down your answers to the following questions:

1. Look at the transportation sector over the 100-year timeline:

<https://ourworldindata.org/grapher/ghg-emissions-by-sector>

1. At which points do emissions increase or decrease sharply, and what historical or societal factors (e.g., rise of cars, public transport, industrial changes) might explain these trends?

2. Compare the transportation sector to other sectors on the graph. How has its share of total greenhouse gas emissions changed over time, and what does this tell us about the role of transportation in climate change?

2. Look at the o the GHG emissions table:

3. Why do you think transportation emissions are harder to reduce than those from power generation or industry are?

4. What solutions could help make transportation more sustainable?

Worksheet 3

Group Name: _____



On the map choose the route to school with the **lowest possible carbon footprint** (Distance 10Km in total).

Your journey includes three segments:

- From the **home** (starting point) to **Stop A** (1 Km)
- From **Stop A** to **Stop B** (3 Km)
- From **Stop B** to the **school** (6 Km to destination)

Use the **AR options provided** to explore different modes of transportation and their environmental impact.

Consider the **CO₂ emissions** produced.



Walking



Bicycle



Electrically assisted scooter



Combustion car



Electric car



Combustion Bus (Petrol)



Electric bus



Metro



Regional train

Fill in the table below

Segments

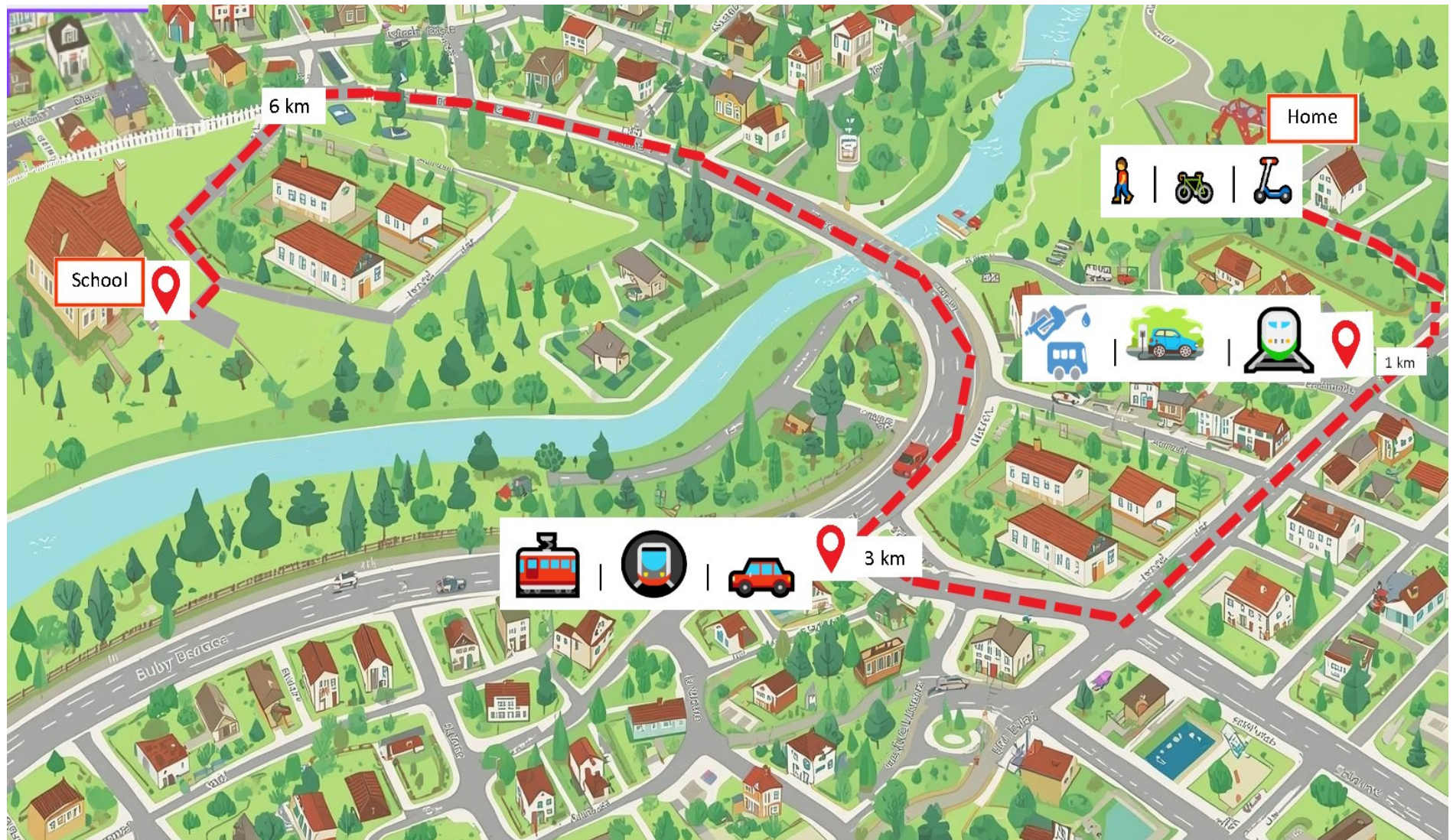
Transport Mode

1 (Distance 1 Km)

2 (Distance 3 Km)

3 (Distance 6 Km)

Total CO₂ Emissions (kg)



Part B: Outdoor Learning Activities

ACTION BOUND: Steps to Reduce Your Carbon Footprint in Transport



Bound: Steps to Reduce Your Carbon Footprint in Transport



Get the Actionbound app for free in the Apple App Store or at the Google Play Store

Scan the QR code with the Actionbound app



Steps to Reduce Your Carbon Footprint in Transport

Scan this QR code with the Actionbound app to start the Bound

The white area surrounding the QR codes should remain so that they can be scanned reliably, Just cut along the dashed lines.

QR code tasks

 Its time to move! Go to the green...		
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Physical & Augmented Reality for Climate Change Education



Co-funded by
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Project Partners



ISTITUTO COMPRENSIVO
GROSSETO 4



Bastia



Associated Partners



1st Experimental
Primary School of Pyrgos
Wonder is the seed of knowledge



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