



CO₂ FOOTPRINT OF THE JOURNEY FROM HOME TO SCHOOL

Goal(s):

The pupils to become aware of how their contribution to CO₂ emissions depends on their choice of transportation from home to school.

General description of the activity:

On the same day, all the pupils record the distance they travel from their home to the school and the time it takes to cover that distance. If their journey includes different types of transport then each of these is recorded separately. The data is used to calculate the resulting daily CO₂ emissions.

Required materials:

- Map of the local area showing where pupils live, preferably large enough to hang on the wall of the class room.
- Small flags and colour pens/pencils.
- String and ruler.
- Watches.
- Recording materials
- Presentation materials.

Required pupil skills:

Counting, telling time, measurement in m and km, vehicle classification, directions/orientations (points of compass), map scales, road safety, knowledge of CO₂.

How does this activity fit into the curriculum:

This activity is well suited for lessons in Mathematics, Science, Geography and Citizenship. Also good literacy opportunities for speaking and listening and presentation (possibly with the assistance of information and communication technology).



Guidance 'Aids':

These Aids are referenced in the instructions below and are designed to help you plan and implement the lessons.

Aid 1 – Background information on mobility and CO₂ emissions

Aid 2 – Draft letter to the parents

Aid 3 – Measuring methods

Aid 4 – Data collection sheet

Aid 5 – CO₂ calculation sheet

Aid 6 – Examples of arguments for and against the different types of transport

Safety issues:

The pupils should be aware of basic road safety. The pupils will be at additional risk because they will be concentrating upon the activity as well as adhering to road safety rules. Parents need to be informed of all this (see Aid 2 below).

Individual steps of the activity:

Required time:

1. Preparation of narration on mobility and CO ₂ emission issues.	Preparation
2. Explain the exercise to the pupils. The choices we make in our everyday lives have an impact on the CO ₂ emissions and the climate of the world. For inspirational background literature you may, for example, consult your local energy agency (see contact list for AL project).	Introduction – 1 lesson (see Aid 1 below)
3. Hang a map on the wall of the classroom showing the area from which all pupils come. Draw the journey of each pupil on the map for example indicating the name of the pupil with a little flag.	
4. Explain the different methods of measuring the distance and time to the pupils and agree with each which methods are appropriate for their particular journey. There are various ways to measure the distances. Some suggestions are shown in the table below (see Aid 3 & 4) , but the pupils might think of other ways to measure their journeys. Methods that can be used by the pupils on their own are to be preferred if there are more than one option.	
5. Since the parents are likely to be involved in the journey from home to school, start the preparations by explaining the exercise to the parents of the pupils. This allows the parents to make sure that enough time is set aside for recording the journey information on the day in question. Alternatively you may send a letter to the parents explaining the need for extra time for the journey (see Aid 2) . The letter could be written together with the pupils. Safety issues should be included in all this.	



<p>6. Pupils measure their journey.</p> <p>7. For each of the measured journeys calculate the CO₂ impact together with the pupils and find the total for the class (see Aid 5 below)</p> <p>8. Discuss the difference between the different types of transport (see Aid 6 below)</p> <ul style="list-style-type: none">➤ Why do we have public transport?➤ Can two or three travel together in the same car instead of separately?➤ Are there differences between summer and winter?➤ Can benefits be gained from changing to a different type of transport i.e. less CO₂, better health or safety etc.?➤ Is it possible for the pupils to choose a different type of transport that has a lower CO₂ emission?➤ What would be the impact of the entire class (or school) over an entire year?	<p>Experiment and analysis – 1 lesson for calculation and 1 lesson for discussion</p> <p>The exact requirement depends greatly on the size of the group, the age level, and your aim for the activity.</p>
<p>9. The results of the exercise are presented to the parents at school. It is important that no one is shamed for their choice of transport. Instead the discussion should focus on the results for the class as a whole and what the class and their parents as a whole can do to reduce their CO₂ emissions caused by their journeys.</p>	<p>Presentation of results – 30 minutes of parent meeting</p>

Suggestions for combination with other AL activities:

"Travel habit now and then" – Reflections on the environmental perspective of past and present means of transport for personal travels.

"Travelling rations" – The pupils try out how far they can get with various means of transport if energy is rationed.

"McCar" – Observing journeys and discussing potential savings (only suited for older pupils).

[The listed activities above may change when all the activity sheets have been finalised.]

Variations:

Incorporation in other lesson topics: The exercise could be integrated with traffic safety training and an exercise to identify what are the hazards on the journey from home to school.

Increased complexity of the activity to suit older pupils: More complex and accurate calculations can be made using for example the information available from our local energy agency or the internet.



- What is the fuel consumption of different car models?
- Does the journey pattern depend on/change with the age level of the pupils?
- What are the effects of CO₂ emissions in the long run?

Reduced complexity: To target the younger pupils the focus of the exercise can be shifted from mathematical calculations to mapping of the journeys and visualisation of the CO₂ impact using footprints which size signifies the CO₂ impact. The necessary calculations can be made by you.

It is possible to focus on the energy consumption – i.e. the amount and type used – instead of CO₂ emissions if this fits better into the planned curriculum.

Increased dissemination: Have the class prepare a presentation or exhibit for the entire school. Compare results with other classes/schools, discussing differences and similarities. Older pupils could try to find a way to communicate the concept of a carbon footprint to younger pupils. If the entire school is involved in the activity, the pupils could arrange a fair at which their results are displayed in a variety of ways.

Active Citizenship!: Apart from influencing the choice of type of transport of pupils and their families, the results can also be used to influence local decision makers so that improvements can be put in place e.g. school management and/or local traffic authority.



CO₂ footprint – Aid 1



Aid 1 – Background information on mobility and CO₂ emissions

Local energy agency website – [Insert web address]

National energy agency website – [Insert web address]

<http://ecoagents.en.eea.europa.eu/> - The Eco Agent website of the European Environmental Agency where pupils can learn about environmental protection issues through a game as Eco Agents (in all EU languages).

[The exact contents of Aid 1 will be determined by each AL project partner.]



Draft letter to the parents

Dear parent

As you may be aware, the curriculum this year includes learning about renewable energy, energy efficiency, and how we can reduce CO₂ emissions.

As part of this work, we aim to calculate your child's emissions of CO₂ on the way to and from school. This calculation is done by filling in a chart (at school) where we first measure the distance to and from school (for example by walking, looking on a map or looking at the distance meter in your car). Then we calculate how much CO₂ emissions are produced in one year. Then we will discuss in class the effect of different kinds of transport on the environment in terms of CO₂. The following questions will be raised:

- What are the reasons for choosing a certain mode of transport?
- What are the environmental benefits of using a mode of transport with low CO₂ emissions?
- How can we reduce CO₂ emissions by using different modes of transportation?
- Are there any other benefits of using different modes of transport? (i.e. health & safety)

We need parents to help us compile some data for this project by setting aside a little bit of extra time on the way to school one morning.

*[Teachers insert what they want parents to help with. This may be counting the steps when walking or reading the distance meter in the car etc. - see **Aid 3 below**].*

If you have any questions please contact me.



Measuring methods

Type of transport:	Measuring method:
By foot	<p>The pupil counts the number of steps required and measures together with the teacher the length of a normal step.</p> <p>Number of steps * Length of a step recorded in centimetres / 100 = Distance in metres</p>
Bicycle	<p>The distance of the journey can be measured on a map. If the journey is very twisted and difficult to measure on the map with a ruler, then you may need to use a thread to find the length. Tie a knot on one end of the thread to mark the starting point of the journey and then place the thread so that it follows the line of the journey. Mark the other end of the journey with a pen or simply hold on to the point with the fingers while you lift the thread away, straighten it, and measure the length with a ruler (you can also buy instruments that can do this).</p> <p>Length of thread in centimetres * map scale = length in true life in centimetres.</p> <p>Length in true life in centimetres / 100 = Distance in metres</p> <p>Alternatively a distance meter similar to the one in cars can be used.</p>
Bus, tram/metro, train	<p>The distance of the journey can be measured on a map. If the journey is very twisted and difficult to measure on the map with a ruler, then you may use a thread to find the length. Tie a knot on one end of the thread to mark the starting point of the journey and then place the thread so that it follows the line of the journey. Mark the other end of the journey with a pen or simply hold on to the point with the fingers while you lift the thread away, straighten it, and measure the length with a ruler.</p> <p>Length of thread in centimetres * map scale = length in true life in centimetres.</p> <p>Length in true life in centimetres / 100 = Distance in metres</p>
Car	<p>Together with the driver of the car, the pupil reads the kilometre meter on the dashboard at the start and the end of the journey.</p> <p>Kilometres at end – kilometres at start = Distance in kilometres</p> <p>Distance in kilometres * 1,000 = Distance in metres</p> <p>Alternatively the distance can be measured on a map in the same way as described under "Bicycle".</p>





Data collection sheet

Pupil name: _____

The recorded journey is made
 2 times per day,
 5 days each week,
 37 weeks of the year.

That is 370 times per year!

Type of transport	Number of steps (A)	Length of steps in centimetres (B)	Length of steps in metres (C=B/100)	Metres per year (A*C*370/1,000)
By foot		cm	M	km/year

Type of transport	Length of string in centimetres (A)	Scale (map: real life) (B)	Length in metres (C=A/B)	Metres per year (C*370/1,000)
Bicycle	cm	:	m	km/year
Bus	cm	:	m	km/year
Tram/metro	cm	:	m	km/year
Train	cm	:	m	km/year

Type of transport	Kilometre reading at start (A)	Kilometre reading at end (B)	Difference (C=B-A)	Metres per year (C*370)
Bicycle	km	km	km	km/year
Car	km	km	km	km/year





CO₂ calculation sheet







The recorded distances from all pupils are added up and noted in column B. Then the CO₂ emissions per year can be calculated and the total emissions found.

Type of transport	Typical energy type	EU average CO ₂ emission (A)	Journey distance per year (B)	CO ₂ emission per year (A*B)
By foot	Food and water	None		
Bicycle	Food and water	None		
Bus	Diesel, gas, electricity			
Tram/metro	Electricity			
Train	Diesel, electricity			
Car	Gasoline, diesel			
Total				





Examples of arguments for and against the different types of transport

Type of transport:	Arguments for:	Arguments against:
By foot 	<ul style="list-style-type: none"> ➤ Gives healthy physical exercise that makes sitting still in the class room easier ➤ Great in good weather ➤ Possible to do together with friends ➤ Free of charge ➤ No fossil fuel based CO₂ emissions 	<ul style="list-style-type: none"> ➤ Takes time ➤ Not so fun in bad weather ➤ Safety crossing dangerous roads?
Bicycle 	<ul style="list-style-type: none"> ➤ Quicker than by foot ➤ Gives healthy physical exercise that makes sitting still in the class room easier ➤ Great in good weather ➤ Possible to do with friends ➤ Free of charge ➤ No fossil fuel based CO₂ emissions 	<ul style="list-style-type: none"> ➤ Takes time ➤ Not so fun in bad weather ➤ Safety crossing dangerous roads?
Bus 	<ul style="list-style-type: none"> ➤ Safe ➤ Short distance to the bus stop ➤ Possible to do together with friends ➤ Cheap ticket ➤ Low fossil fuel based CO₂ emissions 	<ul style="list-style-type: none"> ➤ Long distance to the bus stop ➤ Difficult to get a seat during peak hours ➤ Can get stuck in a queue during rush hours
Tram/metro, train  	<ul style="list-style-type: none"> ➤ Safe ➤ Short distance to the tram stop ➤ Possible to do together with friends ➤ Cheap ticket compared to the cost of taking the car ➤ Has its own tracks and is therefore not stuck in traffic ➤ Low or no fossil fuel based CO₂ emissions 	<ul style="list-style-type: none"> ➤ Long distance to the tram stop ➤ Difficult to get a seat during peak hours
Car 	<ul style="list-style-type: none"> ➤ Safe for those inside the car ➤ The parents drive the same way anyway and can save time and money by including the pupils 	<ul style="list-style-type: none"> ➤ Creates hazardous situations when many parents drop off and pick up their pupils at school ➤ Can get stuck in a queue during rush hours ➤ Large emissions of CO₂ ➤ Increased health problems

CO₂ footprint – Aid 6



Search words:

Energy end-use	General topic	Educational subject	Age level
Transport Space heating & cooling Hot & cold water Lighting Electric appliances	General sustainable development Renewable energy Energy efficiency (saving) CO₂ wise transport	Mathematics Science Geography Citizenship	6-8 years 9-10 years 11-12 years