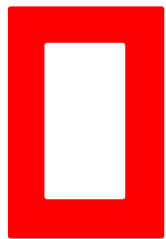




www.e-co-foot.eu

Teaching material on Ecological Footprint



LEARNING UNIT 5

MOBILITY

AGE GROUP 1

10-13 YEARS

Version 2 | June 2020



This material is part of a course on the Ecological Footprint for students.

The course consists of the following modules for two age groups:

Age group 1 10-13 years	Age group 2 14-18 years
Calculator	
General Introduction	General Introduction
Mini Hectare Workshop	Mini Hectare Workshop
Nutrition	Nutrition
Housing	A. Housing core B. Housing additional
Mobility	Mobility
Other Consumption	Other Consumption
Background information	

You are
here

All the material can be downloaded for free at www.e-co-foot.eu in different languages.

calculator.e-co-foot.eu is an online tool that allows students to log their daily activities and trace the Ecological Footprint of their habits. Group functions for teachers make it suitable for a warm-up or later check-up-session.

elearning.e-co-foot.eu is an e-learning package with selected content from the lectures. E-learning can be used for blended learning of this course, as homework or as training and competence check after in-class lectures.

IMPRINT

akaryon GmbH, Austria www.akaryon.eu

Plattform Footprint, Austria www.footprint.at

Colegiul „Vasile Lovinescu” Fălticeni, Romania www.agricolfalticeni.ro

Eötvös Loránd University (ELTE), Hungary savariakemia.elte.hu

Environmental Education Center (K.P.E.) Pertouliou-Trikkeon, Greece <https://blogs.sch.gr/kpepertoul/>

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LEARNING UNIT 5

THE ECOLOGICAL FOOTPRINT OF MOBILITY

TEACHING MATERIAL FOR AGE GROUP 1 (10-13 YEARS)

- + The aim of this learning unit is for the pupils to understand what consequences their travels and mobility choices have.
- + If there was no prior introduction of the Ecological Footprint, it also should be introduced after the ice-breaker.
- + The measure of the Ecological Footprint of different modes of personal mobility as well as the role of transport should be introduced.

Short Overview

Duration of Learning Unit:

one lesson of 45-50 minutes

This Unit consists of

- This pdf document with description of the Unit: [ecofoot_Mobility_Teachingmaterial_agegroup1.pdf](#)
- PowerPoint Presentation: [ecofoot_Mobility_Presentation_agegroup1.pptx](#)
- Exercises, homework, games: [ecofoot_Mobility_Exercises_agegroup1.pdf](#)
- Leaflet to hand out to students: [ecofoot_Mobility_Leaflet_agegroup1and2.pdf](#)

Brief description of the Learning Unit

Students learn about a specific part of Ecological Footprint, namely the mobility part of it. If they have not learned about Ecological Footprint, its concept is also briefly introduced. Mobility is an essential part of our life as we are not plants. They learn about the effects of different kinds of mobility types, and they will be able to decide which form of travel is beneficial for humans.

Overview of contents:

estimated duration min.

- | | |
|---|-----|
| 1. Ice-breaker – how did you come to school? | 5 |
| 2. Introduction of Ecological Footprint – summary of Unit 1 | 3-8 |
| 3. Mobility - Ecological Footprint of modes of travel | 8 |
| 4. How can you decrease your Footprint? | 6 |
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| 6. The journey of butter | 6 |
| 7. Transportation – shopping | 5 |
| 8. Take home messages | 3 |
| 9. Five Footprint rules | 3 |
| 10. Homework | 2 |

Setting:

classroom

Items needed:

computer and beamer for PowerPoint presentation

Worksheets for printing:

- for the Footprint quiz: the 2 slides of the presentation if you want to hand them out

Connection to subjects: biology, physics, chemistry, history, geography, mathematics, science, environmental sciences, national language, English as foreign language, other foreign languages, religion, project lesson (country specific subjects)

E-learning: <https://elearning.e-co-foot.eu/>

6

minutes. Then the teacher asks: **How much do you think it costs?** Then (s)he writes the guesses (0 for walking). Then (s)he goes on to say: **You might not know exactly the price of the travel, but most people decide on the basis of time, or money.**

Let's go to school!

How did you come to school today?

By bus

By train

By car

On foot

By bike

How long did it take? 0-10 min 10-30 min 30-60 min

How much did it cost?

Is there any other important aspect of the choice?



Then (s)he goes on asking: **Is there any other aspect of travel we should take into account when we make the decision?** After collecting some answers (s)he says: **Yes, the size of the Ecological Footprint, the amount of burden we put on our environment by deciding to take this or the other mode of travel. Which burden do they cause, what do you think?** The pupils give answers like „smoke, exhaust gases, noise, ...”. After some answers (s)he asks: **And which means of transport has the biggest and which the smallest impact on the environment, what do you guess?** After collecting some answers (s)he goes on to say: **Very good guesses, but first let us go (back) to the definition of the Ecological Footprint!**

Repetition
Unit 1

2. Introduction of Ecological Footprint – summary of Unit 1

Here the teacher has to decide: if the concept of Ecological Footprint and biocapacity was already introduced (e.g. LU1), (s)he can be quicker, just to refresh the previous knowledge, but one should talk about this in more detail, if this is a standalone unit and no previous introduction to the Ecological Footprint has taken place.

What does the Ecological Footprint measure?

It measures area we need for:



How much bio-productive area do we have?



(2016/2019)*

21% bioproductive LAND
4% bioproductive OCEAN
~ 1/4 of Earth's surface
= appr. 13* bn hectare bioproductive surface



deserts, ice

Wolfgang Polke, Plattform Footprint



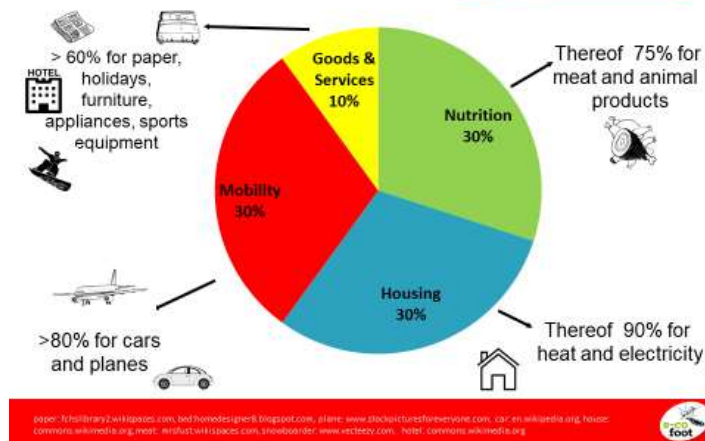
The teacher should tell these important definitions and pieces of information to the pupils:

- We humans need to **consume** in order to survive. Everything we humans consume requires **resources**. These resources have to be produced by nature and therefore require certain **areas of land**.
- This land is **limited** because we live on a limited planet. In fact, we can only use **25%** of the Earth's surface! The usable area is called bioproductive area.
- **The Ecological Footprint measures the areas we use** in different aspects of life: for housing and the consumption of heat and electricity, for mobility (e.g. for driving and flying), for nutrition (the things we eat and drink) and for the many other things we use (paper, electronic devices...).
- There are different types of area we use to produce these things: farmland, pasture, built up areas for industry, houses and roads, forests, oceans and waters. The Footprint contains all these areas, but also takes into account the CO₂ emissions we produce.
- We must drastically reduce the emissions of CO₂ and other greenhouse gases very soon, otherwise **global warming** cannot be stopped. The consequences for life on the planet will then be drastic. CO₂ can be stored. This is done by oceans and lakes, but also by plants which absorb it, transform it and use it for their own growth. To a certain extent, **trees can bind CO₂**, i.e. remove it from the atmosphere.
- The Ecological Footprint therefore also **includes the area of forest that would be needed to bind CO₂ emitted by human activities**. This area can be up to half of the total Ecological Footprint, so it is very significant!

If they have already learned it this might be enough:

Ecological Footprint, as you remember, measures human demand on nature, so all the demands on nature of a given country, divided by the number of its inhabitants gives the per capita Ecological Footprint. The fair share is the globally available biocapactive area divided by the population of Earth.

Ecological Footprint of an average Hungarian



With the next slide, the teacher goes on like this:

You might remember this chart when you learned about Ecological Footprint. This pie-chart shows the distribution of the Ecological Footprint of an average Hungarian. It is 3.6 global hectares per person, which is roughly twice as much as the fair share per person on Earth (1.6 gha): if everyone on Earth lived like Hungarians, we would require two planets Earth! Of all this 30% is food with 1.1 global ha. Most of it comes from eating meat and animal products.

30% is made up of housing, of which the biggest part is heating and electricity.

Another 30% of the Footprint of a Hungarian is mobility, that means the moving of people from one place to another. Most of this comes from driving and flying.

10% is the share of other consumption - this is everything else we buy except for food (car and home), such as furniture, clothing, paper and the other things of everyday life. The largest share of "other consumption" is paper. An average Hungarian consumes about 90 kg of paper a year.

The size of our Footprint depends mainly on the amount of energy we need or consume for our lives (including food), but it also depends heavily on the form and source of the energy used. The three main areas, where we use these resources are roughly equal for an average Hungarian: Nutrition, Housing and Mobility. The things which matter most in nutrition are how much we eat, and of that how much is animal related food (meat or dairy products) and how and how far the food travels until we eat it (plane, ship, truck). In housing, the amount of heat and electricity and their source are the most important. In our personal mobility the amount of car and airplane travel is the biggest factor. In consumption the amount, durability and the origin of stuff we buy, use and throw away are what count. Today we shall analyze this red part of our Footprint, mobility.

3. Mobility – modes of travel

The teacher goes on by saying:

Mobility plays a very important role in our lives, and it has a very high impact on our Ecological Footprint. Let us put together when we need to move, travel, how is our mobility structured.

Mobility

Why do we travel? Why do we need mobility?

Go to school/work daily

Leisure, sports, holidays, hobbies

Transport of goods



First of all, there is a daily part of it: every workday we go to work or school. Usually the biggest part of our annual mileage comes from these daily trips. Most of these daily trips are quite short, for example, the average daily commute distance in Hungary is 2.5 km.¹ The size of the Footprint generated by commuting depends not only on how far we work/learn from home, but mainly on how we cover this distance. The second part comes from our habits, how often we visit friends, family, how far and how often we travel for leisure, sports, hobbies or how far we travel for our holidays. But we also have to move the products we consume, mainly the food that we eat. We have to transport our food from the grocery store to our home, but it also has to be transported to the store from the fields and factories. Our food and other consumer products often travel more than we do!

Modes of travel

- on foot
- by bike
- by train
- by bus, tram, underground (public transport)
- by boat
- by car
- by airplane

- the speed, cost, range, effort, infrastructure is VERY different, so are the Footprints!



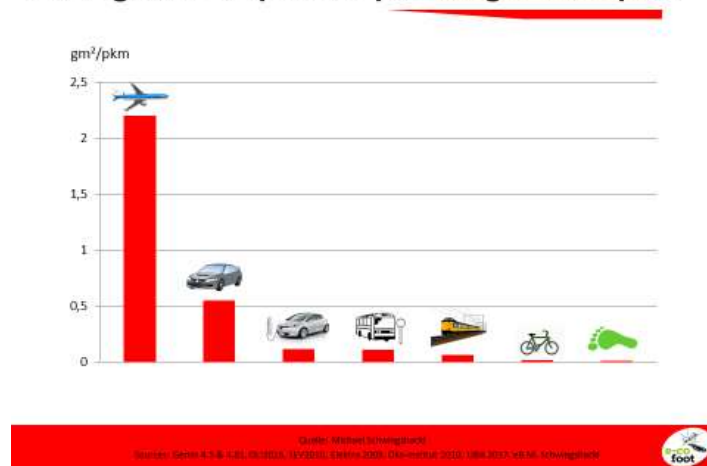
The modes of travel is listed on the next slide, and the teacher says:

Here you can see a list of the means of transportation, we have collected most of them when we were planning our trip to Vienna. Some of them are very common, we use them all the time, some are less common. Not all means are available to everyone. Sometimes your choice is limited. It depends on where you live, how much money you have, where and how far you want to travel to and also on your age and health. Not everyone can ride a bike, drive a car, take a tram, boat or airplane. You need a waterway for a boat, an airport for an airplane, most of the times a bigger city for tram, trolley or underground. You can

¹ (<https://www.nationmaster.com/country-info/stats/Transport/Commute/Distance>)

make long trips on foot or by bike, but need the time for it or the will to combine healthy exercise with your mobility need. You have a lot of choices, if you are a healthy and wealthy young adult in a major city, but you have very little choice if you are poor and sick and old, living in a remote area. It is cheaper, healthier and has a lower Footprint if you use human power (walking or riding the bike) for moving around, and in most of our trips (up to 2-3 km) they are the fastest too! If it is raining, or we have a sore knee, we should use the public transport, because of its lower Footprint compared to the car. In some rural areas you cannot move around by a proper public transport (at the moment) and you need the car more often than in the cities.

Ecological Footprint of passenger transport



For the comparison of the Footprint of different modes of transport, the teacher shows this diagram and can interpret it like this:

In this chart you can see the size of Ecological Footprint associated with many modes of passenger transport. There are two car types and engines listed, and the Footprints (in global square metres over passenger kilometres) range from almost nothing (pedestrians, bicycles) to more than 2.2 (short flights). These values are not only the CO₂ masses directly burned by the engines, they also contain the energy needed to produce and maintain the road or the car itself. The relatively short (less than 1500 km) flights have an extremely high value, because the airplanes consume the most when they are accelerating and climbing. There are 2 other factors that make air travel by far the worst mode of transport, namely you cover a very long distance when you fly, very fast, and that the exhaust gases damage our atmosphere at a very high altitude where the air is very thin and thus most vulnerable. The CO₂ emissions per passenger km and the Ecological Footprint values vary considerably with the type of the engine, size of the vehicle, the number of passengers carried and the distance covered.

The teacher comments the next slide by saying:

This slide shows graphically which modes of travel have smaller and which ones have bigger Ecological Footprints. Based on this, you can make your choice, and you can make a big difference if you take Footprint size also into consideration when you make your travel plans, not only time and money.

Ecological Footprint of modes of travel

- on foot
- by bike
- by train (boat)
- by bus, tram, subway (public transport)
- by car
- by airplane



4. How can you decrease your Footprint?

How can you decrease your Footprint?

Walk or bike to school/work!

Why?

- It is cheap!
- It is healthy!
- It is fast! (trips within 1 km are faster on foot, within 2 km by bike)
- You can see more!
- The air is cleaner.
- You help save the planet!

After seeing the sizes of Footprints, the question arises: How can you decrease your Footprint? Well, the first way to do that, if you do not live very far from your school/work is to walk there or ride a bicycle (or scooter). They are the cheapest, easiest, healthiest, and also fastest alternatives if you live close enough to your school/work. By getting out of the car, the air will be cleaner, your (and your neighbours') health better, and you help saving the planet for our grandchildren.

After telling the advantages of walking and biking, the teacher goes on to tell the advantages of public transport as opposed to motorized private transport:

If you live farther from your school/work, and there is no bicycle route, you can still lower your Footprint by avoiding the car and using the community (or public) transport services: train, tram, bus or underground. Public transport has a much lower Footprint than individual motorized transport, because the number of passengers is much bigger, and some of the vehicles (electric trains, trams, trolleys, electric buses) use electricity which very often has lower carbon footprint than fossil petrol. They are also much safer than car travel, and you might have the chance to meet friends or read, learn or work on board. You can even use the wi-fi on the bus or train.

How can you decrease your Footprint?

- If you live farther, **use the community transport!**
(train, bus, tram, underground)

Why?

- Smaller Footprint.
- Less accidents, safer than car travel.
- You can meet your friends on board.
- You can read, work or learn aboard.
- You can use wi-fi on the bus/train.



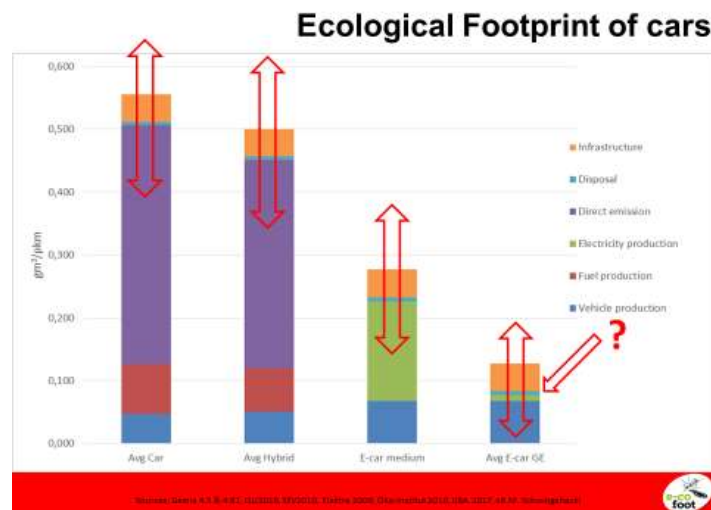
In the next slide, it is told by the teacher, how to use the car more economically:

How can you decrease your Footprint?

- If you cannot avoid car travel you can still lower your Footprint if you:
 - share your car (never travel alone!)
 - consider new technologies using green energy
 - use a smaller car with lower fuel consumption
 - plan your route (no extra miles!)
 - reduce speed
 - use correct tyre pressure
 - avoid pointless acceleration/braking



If there is no alternative to car travel (there is no bus/train in your village), you can still lower the Footprint using a car, by sharing it with other passengers, optimizing your route, and decrease the gas mileage by using a smaller, more fuel-efficient car, reducing speed, regularly checking the correct tyre pressure, driving in an anticipatory style. The new electric vehicles can also reduce Footprint considerably if you charge them with green electricity. When buying a car, you should choose a smaller car with lower fuel consumption, or if you have a lot of money to invest, buy an economic electric car and use it with green electricity!



The Ecological Footprint of different engine technologies can be seen in this graph. If you take a closer look at the size and composition of the passenger car Footprint, the first thing to notice is that the uncertainty (red arrows) is as big, as the difference between the different technologies containing internal combustion engines; average car (with internal combustion engine), average hybrid (also a small battery and small electric motor). This means that you are better off with an economic compact car than with a big thirsty hybrid, containing two engines. You can also see, that the new electromotor technology can lower your Footprint as well (if you live in a country with lots of electricity generated from renewable sources), but in order to make a considerable change, you need to use green electricity for charging your batteries. Therefore you can choose your electricity provider wisely (with UZ46 Green Electricity in Austria for example) or install (your own) photovoltaic solar power station on your roof! The Footprint of vehicle production is bigger for electric vehicles at the moment, and the long-term usability or recycling of the battery pack is still an open question, but at the moment this is the best way to reduce your Footprint for motorized individual transport in countries where the electricity is produced using low-carbon technologies (renewable or carbon neutral).

The teacher introduces the problem (the decision a family faces) of finding a place and a transport for holidays by saying:

Holidays (leisure, sports, hobbies)

- You can have a perfect vacation in your own country!
- If you travel abroad, consider the train or the coach!
- Try to avoid flying! It has the highest Footprint.



Apart from our daily commuting we also like to have vacation in a distant place, at the sea etc. In order to have a perfect vacation, you do not have to travel very far: sometimes the next town, wood or lake is enough to leave your problems at home and regenerate yourself and have a nice time with your family. When you travel far away, you still should keep in mind, that flying is the most environmentally unfriendly travel mode! If it is cheap, it doesn't mean, it is sustainable, or comes at low "ecological costs". It just means that someone else is paying the costs: usually your children/grandchildren and old parents/grandparents.

5. Transport: The journey of butter



Our products travel more and more until they get to us. In our grandparents' time, if you lived in a village, the way from the cow to the butter and then to your table was very short and easy. All processing took place locally, and you walked to the local grocer's to buy it.



Nowadays however, most of the butter produced takes a long-long way (hundreds of kilometres) and is being processed using machines along the way, until it gets to the supermarket. From the supermarket to your fridge it also most likely travels by car, which would have very often the biggest Footprint (distances

bigger than 5 km!!). Why does the last kilometre have such a big Footprint? Until the product reaches the supermarket, it travels with a huge amount of goods: in a fully loaded truck, the weight of the goods exceeds the weight of the empty truck. However, on the last kilometres, a vehicle weighing more than a ton needs to be moved in order to transport a few kilograms of products (and you) home from the market.

After these few slides about transport of goods, the teacher should summarize how this part of the mobility Footprint can be decreased or minimized by saying:

Shopping & Mobility Footprint

- **Don't go shopping by car!**

The last kilometer – OF YOUR SHOPPING TRIP - can cause the highest Ecological Footprint per product, especially if you go by car. Therefore it is better to buy at a local store, not a supermarket out of town where you have to go by car!

- **Avoid products from overseas!**

The products that come by plane have the biggest "Transport-Footprint"! There are too many things, also a lot of "seasonal"-clothes/fashion that come by plane!

- **Prefer local and seasonal products!**

Sometimes, buying local products could lead to a higher Footprint, because the product is out of season, and it takes more energy to heat the glasshouse than transporting it from Greece. It is the best if you eat the seasonal fruit from your own garden when it is ripe and delicious!

Best of -> Your Garden



You can also decrease your Ecological Footprint if you buy/eat local products from local stores. In general, the less the products travel, the less is their Footprint! If you can grow your own fruits and vegetables at home those products can have practically zero Footprint! But you can still buy them at a local market. For other products use the local store. The supermarket usually carries more products from overseas, which travelled a lot! Don't buy products which came by airplane (e.g. fruits out of the season) If you go shopping by car, you not only pollute the air and ground, cause global warming by the exhausts of the car, but you tend to buy more stuff, because the car can carry the extra weight more easily. But if you do the shopping consciously, you make a shopping list beforehand and stick to it.

Mobility and Footprint



Land use



Mobility has a very big effect on land use! New and ever wider roads take away the habitat of all living beings: plants, animals and humans as well!! New roads are always expensive, they take away our land and generate even more traffic!

Road transport

Freight traffic 25%



Passenger traffic 75%

You should note that the energy consumption of passenger traffic is more than twice as high as that of freight traffic! There is plenty of room to lower them both!

6. Take home messages

Take home messages

- **80%** of the Mobility Footprint is caused by **cars** (70%) and **flying** (10%) (goods transport is counted towards consumption)
- Therefore most important is:
- **Use cars less!**
- **Travel without using planes!**
- **Buy local and seasonal products at a local store!**

These measures can reduce the Mobility Footprint considerably.

If you want to save the planet for yourselves and your grandchildren, ask how your grandparents used to live and try to adapt those ideas in your life.

Since most of the Mobility Footprint (in Hungary) is caused by **cars** (70%) and **flying** (10%) (goods transport is counted towards each other consumption like food, electronic devices etc.), to reduce your mobility Footprint, you should **use cars less! Travel without using planes!**

Buy local and seasonal products at a local store! For general advice on how to lead life, ask how your grandparents used to live and try to follow their example!

Fast reduction: 5-finger Footprint rules!

Enjoy life with a smaller Footprint: more friends, family, time, fun. 

Act together to create a sustainable world that supports living on a small Footprint! 

Reduce meat and animal products! Prefer local and seasonal products, as much as possible from organic farming. 

Travel with a small Footprint – by train, bike and bus. Don't fly! Ride cars less, never alone, use green electricity! 

Home green home! with green energy, well insulated, smaller, access to public transport 

Bus: en.wikipedia.org, bicycle: gossamer.net, organic food: www.cothandbenmarks.com, train: arping.com, green electricity: www.venturesquare.net

The teacher summarizes the fastest ways (also called five finger rules, as there are five of them: one for each finger to count) to reduce Ecological Footprint by saying:

If you are an average European citizen, these are the measures to take if you want to lower your Ecological Footprint as quickly as possible.

1. Enjoy life! There are so many activities which have practically no Footprint at all: spending time with your friends or the family, having fun doesn't mean a high Footprint. So find your way of life and optimize Footprint and happiness. If you act alone and reduce your Footprint, it is a great achievement,
2. but if you can convince someone else, if you can act together the effect is multiplied and together you can even put pressure on your politicians to act for our civilization and not for their own material interests.
3. By reducing the amount of meat and other animal products you eat, your food Footprint decreases significantly.
4. By avoiding cars and planes you can lower your mobility Footprint considerably.
5. Since most energy is used for heating and electricity, a smaller, well insulated home, using green energy, harvesting solar power and in a location with access to good public transport is ideal.

Exercises, homework and games

7. Homework and game ideas

The homework and game ideas can be found in a separate document in the downloaded zip file:
[ecofoot_Mobility_Exercises_agegroup1.pdf](#)

There are four homework ideas/games in the document:

How do you go to school?

Travelling products

Holiday planning

Game: footprint quiz

Sources and Bibliography

Sources for all pictures can be found at the end of the PowerPoint slideshow.

Footprint data: 2019/2016 Global Footprint Network. and Plattform Footprint

EUROSTAT data: <https://ec.europa.eu/eurostat/home>

<https://www.nationmaster.com/country-info/stats/Transport/Commute/Distance>