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Teaching material on Ecological Footprint

GUIDE TO EXCURSIONS AND PROJECTS

AGE GROUP 1&2 10–18 YEARS

Version 2 | Aug 2020

This material is part of a course on 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	

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 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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BY NC SA

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TEACHING MATERIAL
GUIDE TO EXCURSIONS and PROJECTS
AGE GROUP 1 (10-13 YEARS)

The aim of this Teaching Unit is to inspire teachers to include the subject on Ecological Footprint in their excursions or organize projects on the subject.

Short overview

Motivation of the Unit: Excursions and projects are a vital part of a school year and a learning experience that students remember better than average learning units in school. With the help of this sample collection for excursion destinations and activities, the teacher can be inspired and take up or repeat content in class lessons.

This Unit consists of different examples for excursions and include:

- Theoretical Preparation time for teachers and students
- A study trip to the chosen establishment
- The presentation of establishment´s representative
- A student-conducted interview by using a questionnaire
- A post processing in form of a written report for the school's newspaper or homepage, …

Proposals of excursion destinations:

- National parks
- Excursion to existing thermal solar heating plants or good practice of it in a household
- Photovoltaic system sales and installation companies, PV system operators (companies or private persons)
- Companies that use their waste heat
- Companies that offer renewable energies: e.g. photovoltaic systems, geothermal energy
- Pellets production company
- Wood chip production plant and wood chip heating plant
- Visit of wind turbines and wind parks
- Hydropower plants e.g. of the municipality or local energy provider
- Mills operated with hydropower: this is for instance the ship mill in Mureck
- Companies offering e-mobility services or car-sharing
- Charging stations for electric cars or electric bikes
- Renewable energy production sites or „eco-parks"
- Innovative buildings like low-energy houses or passive houses
- Bioenergy operated greenhouse with organic vegetables
- Farms

Preparation:

- Teacher's preparation
- Theoretical preparation of the students

During the visit:

- Eco-friendly travel – using public transport to the chosen destination
- Vegetarian or vegan meals for the students
- After arrival there should be a presentation of the establishment's representative, for example with a guided tour through the company.
- After that the students should interview the representative with their prepared **questionnaires** and their acquired theoretical knowledge. Emerging issues should also be asked. Students don't have to hesitate.

After the visit:

There can be a discussion and a common conclusion should be drawn up by the teacher and his/her students. After that the students will write a **report**. This report will be submitted, controlled by the teacher and improved by the students. In the end they will send it to the school's newspaper/newsletter or the school's homepage so that the report can be published.

Evaluation (optional):

Should be done by the teacher, answering some questions, like:

1. Were the set goals achieved?
2. Were lessons learned included?
3. Advantages and disadvantages mentioned?
4. Critical view well-articulated?
5. …

Example 1 National park

A national park can be seen as a hands-on educational resource for learning something about the Ecological Footprint. A visit can enhance the training course experience.

The excursion **can be connected to Unit 1 General Introduction**, **Unit 2 Mini-Hectare-Workshop** and **Unit 3 Nutrition** (e.g. food production through traditional grazing).

What can be done in a national park or near a national park?

- Explain that wilderness (especially in Europe) is only a very small part of the land – most is used by agriculture, infrastructure, built up areas …
- Walk off a hectare of land (stay on paths!) to show how big a hectare is (especially after the Mini-Hectare-Workshop)
- Let students touch different kinds of elements – maybe during a guided cave tour (soil, rock, stones, …)
- Do a forest orientation tour for example during the night but also by day
- Explore a creek or pond and the biodiversity there together with the students – analyse and work with the water (What lives there? Is the creek dry or is the water standing high? Do the water inhabitants and the quality of the river tell something about the climate? Is it flowing or stagnant water? Is a dam near?)
- Follow an Alluvial Learning Path
- Camp in the national park
- Do a boat trip
- Outdoor surviving course: Inspire to play and get along in nature without computer or smartphone (only equipped with natural products and a minimum of resources); possible tasks could be:
    - Draw a map
    - Find the way to a base camp with a map
    - Build an own camp for the night
    - Cook food from simple ingredients
    - Make a campfire
- Help to understand the forces of nature (soil and rock formation, flood, ...)
- Do a rafting tour, trial climbing or attend a high rope garden
- Teach something about original agriculture and mountain pasture (manual work, mining of materials, livestock, and land use or land consumption)
- Visit a Forestry Museum (forest and wood work)
- Visit a waterpower plant nearby and share knowledge about hydroelectric power plants
- Observe animals in the wild
- Listen to and maybe record animal noises and try to determine the animals
- Go for a bike ride or a hike
- Search for materials (wood as example for furniture and paper)
- Pick up rubbish (with gloves or gripping pliers)
- Help planting trees or engage in other caring activities if this is possible
- Ask the students for their favourite place in the park and the reasons for
- Create a nature memory from self-collected natural materials

Best practice example – Gesäuse National Park in Austria

The Walk-in Ecological Footprint

© Gesäuse National Park

How many planets Earth would we need, if all people in the world lived like us Austrians? How do our daily actions influence the Ecological Footprint? Can we do anything for our environment / world on our own? In the “Walk-in Ecological Footprint” at national park “Gesäuse” there is a labyrinth of beech hedges that answers these and many more questions.

This "walkable" Ecological Footprint provides a humorous insight into many facets of a person’s daily life. It offers a valuable experience to test the sustainability of our lifestyle. And just as in real life the multitude of information and messages often remain inscrutable and confusing, in this "footprint" the pupils are confronted with a labyrinth in which questions "lurk" at various intersections, literally leading them into a dead end with incorrectly chosen answers. Like the aberrations of human civilization, many branches lead into a "hopeless situation", have side effects such as environmental pollution or worse living conditions for other people. Only the ecologically sound solutions will lead to the goal and lead through the labyrinth! Around the labyrinth there are different tasks for visitors to solve, like the Footprint Rally, the oversized Footprint Scale and a variety of other exciting activities for school groups.

In the surrounding area there is also the Willow Cathedral, the largest “living” building in Austria, a farm garden and some old domestic fruit trees waiting to be explored by interested students. In the Willow Cathedral there is a research institution with a wide range of learning offers. Here the children can immerse themselves in an unknown world – a handful of forest soil or a water sample self-taken out of the river Enns or the nearby pond with a fishing net reveals them a fascinating microcosm. Under the expert guidance of the national park rangers, they will be amazed at every single leg of a millipede, the cutting tool of an ant, the jet propulsion of a dragonfly larva or the birth of a water flea. With the microscope students will discover animals they have never seen before and admire tiny microorganisms and other natural objects live in the micro- theatre in large projections.

Furthermore, the topics of sustainable energy supply are in the focus of this project.

Along the site there is the “Lettmair Au” one of the last natural sections of the river Enns. A themed 1.5 km long trail receives visitors and deals with different topics in numerous adventure stations: At a giant gaming table, students can recreate river systems, let "self-produced" water flow through narrow rocks or in the middle of gravel surfaces and so learn about the dynamics of flowing waters in an impressive way. They can also sit under an old beech tree and interactively help to shape the narrative story that the beech tree tells about the Lettmair Au. Furthermore, there is a journey through the seasons as well as a station on the subject of deadwood and its importance for the environment. https://www.nationalpark.co.at/

Example 2 Preparation of self-harvested food

You can **connect this excursion to Unit 1 General introduction and Unit 3 Nutrition.**

What can be done during the excursion "We prepare a meal from self-harvested food"?

1. Before the excursion, Learning Unit 3 "The Ecological Footprint of Nutrition" will be studied in class
2. The school class visits an organic farm or herb garden and, under the guidance of the organic farmer, harvests seasonal food (e.g. herbs, berries in spring and early summer, vegetables in summer and autumn, potatoes, fruits, pumpkins in autumn, turnips, cabbage, kale in winter) Wild herbs can also be collected in the wild under the guidance of an herbalist. Bring your own reusable containers or bags.
3. The food harvested by the class is either processed together in the school during lessons to make a meatless meal or there is an opportunity to cook and eat together on the organic farm or at the venue.
4. A debriefing is then held in class to explain why the Ecological Footprint of the meal that was harvested and prepared together was smaller than if the food had been bought in the supermarket.
   Although for cultivation, harvesting and short-term storage at the farm / garden machinery (like a tractor for example) and buildings were used, the following advantages could occur:
   - The food processed directly was not transported by truck or car. As a result, no harmful exhaust gases and no CO_2 were produced (nor was there any noise).
   - The food did not have to be stored in a cold store over a longer term (no electricity was used for cooling).
   - The food did not have to be packed: no cardboard, no printing ink, no plastic
   - It didn´t contain any meat, cheese or eggs. The teacher repeats the reasons why animal foods have a larger Ecological Footprint than plant foods and why they cause other ecological problems (e.g. climate change, water footprint) as well.

   To dive deeper into the matter, the life cycle aspects of different cultivation forms can also be discussed.

Practice example – Harvesting in the school's own vegetable garden

Harvesting including a cooking session and a discussion about its Ecological Footprint can also be done in the school's own vegetable garden if the school has one, and there is no organic farm nearby.

Here is an example for a follow-up report for a vegetable garden project:

"At the beginning of October, it was time again for harvesting in the school's own vegetable garden.

In spring, the 3rd class (7th grade) had cultivated 3 raised beds and 2 ground beds with vegetables during biology lessons. A downpour shortly after sowing had made a second cultivation necessary. The hot and dry summer had been bridged with artificial irrigation.

The children, who are now in the 4th grade, harvested the treasures rich in vitamins at the beginning of October. Potatoes, radishes, cucumbers, tomatoes and beetroot were partly taken home by the children. The rest was prepared during the non-binding exercise "Nutrition and Cooking". The peppers, which turned out to be chilli and were not edible for everyone due to their pungency, provided a special

"spice".
Next spring, they will look again to see what surprises the vegetable garden has in store for them.”

Practice example – Harvesting in an orchard in the school's neighbourhood

If the school doesn’t have an own vegetable garden, harvesting can be done in an orchard nearby the school (after organising an arrangement with the owner). Cooking as well as discussing about its Ecological Footprint can be done in the school.

Example 3 Virtual eco-footprint

This excursion can be connected to all units and especially to **Unit 1 General Introduction**, **Unit 2 Mini Hectare Workshop** (show how big a hectare is in real life size), **Unit 3 Nutrition**, **Unit 5 Mobility** (visualize the effect of traffic; show the amount of forest needed to bind CO_2).

What can be done during the excursion "Virtual eco-footprint"?

This excursion aims at the interpretation of the footprint, the calculation of the area used and its in-field presentation. It is **based on special software.**

Objectives are

- To familiarize pupils with their close environment. In addition to global values they should get to know the environmental and cultural values of their own residence.
- To teach about sustainability
- To help develop environmentally conscious lifestyles
- To build the essential skills of the 21st century (creativity and innovation, critical thinking, problem-solving and decision-making, communication, collaboration, information literacy)

The modern tools of the 21st century offer the use of the smartphone and the world wide web to provide electronic data collection and database building. With this excursion a relationship between teenagers – living in a virtual world of computer games and mobile phones – and nature can be created. Mobile applications that are easy to use on the ground and document the environment well should be used in this excursion to learn something about the own sustainability habits.

Summarising description of the tasks to be performed during the excursion

Pupils should calculate their Ecological Footprint. After the calculation is done, the different calculated areas should be walked around, this way emphasizing the dimensions of the footprint. The coordinates of the major field points can be added and display with GoogleEarth to visualize the space.

Step-by-step instructions

1. Calculate your own Ecological Footprint. (Use the online calculator at calculator.e-co-foot.eu)
2. Make an estimate of how the area you use can be divided into sub-areas; e.g.:
   a. How much forest area do you need? -> ~ 8-12 %
   b. How much water/wetland is needed? -> ~ 1-3 %
   c. How much area is needed for the production of our food? -> ~ 20-25 %
   d. What is the size of the built area? -> ~ 3 %
   e. How much forest is needed for sequestration of CO_2? -> ~ 55-66 %

   If necessary, use the available estimates that apply to your country.
3. Choose areas (forests, water / wetland, pastures, settlements, etc.) in your environment that are important to you.
4. Make photos and / or videos! (You can also add a selfie point and make a selfie.)
5. Record the GPS Coordinates. Get to know and show the areas.
6. Install one of the following apps onto your mobile phone (the ones in red are the suggested free-to-use versions)

Android OS:

- **Vieyra Software:** Vieyra Software aims to make data collection accessible to anyone who owns a modern Android device.
- **Physics Toolbox GPS (free)** waypoints, and track log points, store on SD card. Export data in csv format and send via email.
- **Handy GPS (free)** This is a free trial version and is limited to storing only 3 waypoints, and 40 track log points
- **OSMTracker for Android (free)** This is a full version and it can collect waypoints, track log points (export in gpx format), photos, notes, voice memos etc.

Iphone, iOS operating system:

- **Export Software:** This application uses device sensor inputs to collect, record, and export data in comma separated value (csv), which is used by the Physics Toolbox Sensor Suite, useful for students and teachers in science, technology, engineering and math (STEM) format through a shareable .csv file. Data can be plotted against an elapsed time on a graph or digitally displayed. Users can export the data for further analysis in a spreadsheet or plotting tool.
- **Physics Toolbox GPS:** This app can be particularly useful for recording and superimposing traveled paths on digital maps, and can be used for educational activities to measure long distances and to measure instantaneous speeds to estimate average speed and acceleration.

Physics Toolbox GPS

This sensor app measures and displays latitude, longitude, altitude, speed, and direction, with +/- accuracy and number of satellites.

Data is collected every 5 seconds. All data can be recorded and exported in an e-mail or through Google Drive as a .kml attachment. The data can be loaded onto any app that supports .kml files, such as Google maps, Google Earth, etc.

Smartphone applications

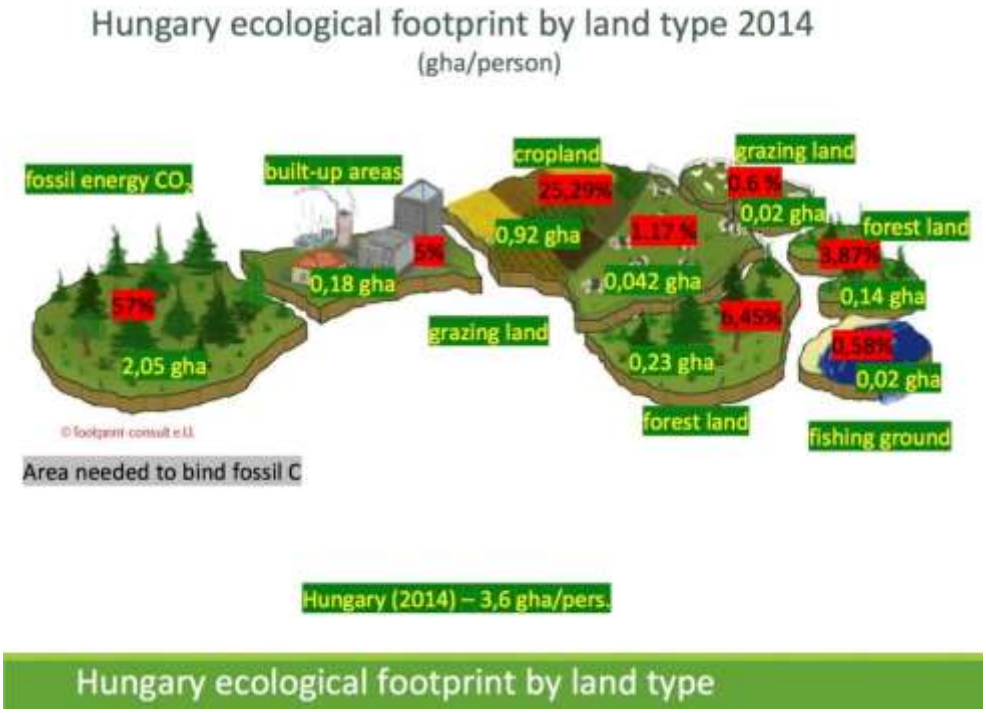
- **Handy GPSLite**: This is a free trial version and is limited to storing only 2 waypoints, and 20 track log points.

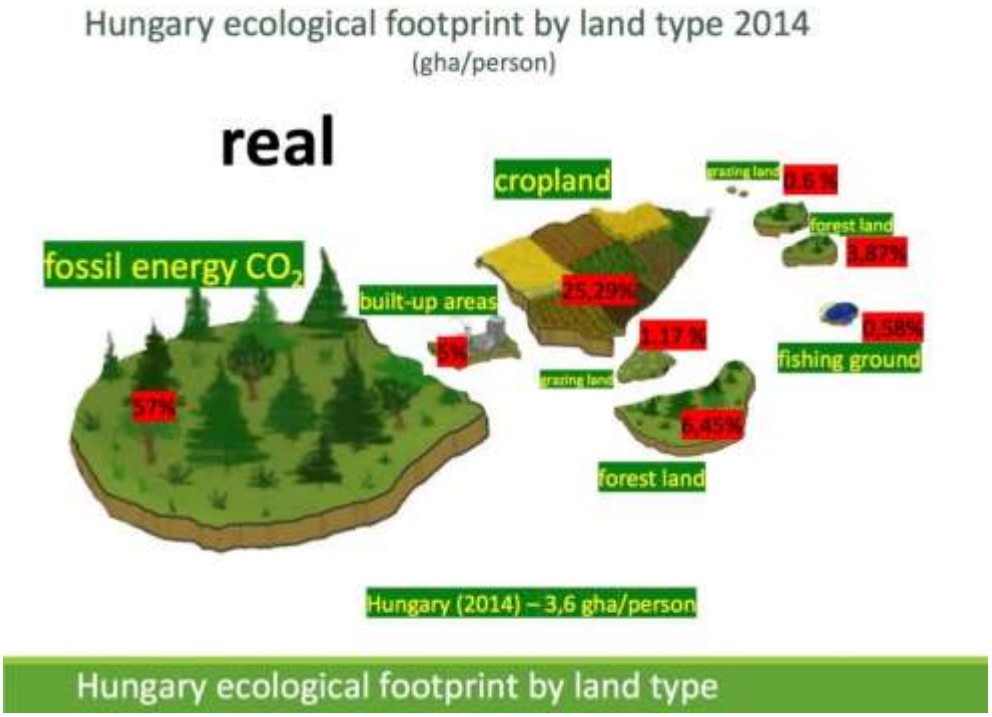
7. Go to the selected sub-area. Start the application and walk around the area. Save POIs and make backups of the covered track in kml, kmz, etc. format.
8. Download and launch the Google Earth application on your computer. Copy the marked sub-areas.

9. Collect data in a central database of your favorite (and protected) locations using **Epicollect5** forms.
10. After the excursion, pupils can demonstrate their findings to their class.

The survey would run similarly with the other described applications for other footprint relevant areas like transport, freight etc.

The following pages show visualizations of the analysis process using data from Hungary as an example:





Virtual ecological footprint by land type - Szombathely

Szombathely ecological footprint – virtual tour

fishing ground FG1 **Perint patak**

fishing ground
eco-footprint – Google Earth

fishing ground FG1 **Perint patak**

fishing ground

fossil energy CO_2 FE1 **Járdányi Paulovics István Romkert**

fossil energy CO_2

Example 4 Excursion to a supermarket

This excursion can be connected to **Unit 3 Nutrition**, **Unit 4 Housing**, **Unit 5 Mobility** and **Unit 6 Other Consumption**.

What can be done during the "Excursion to a supermarket", also called "Sherlock Footprint":

Students visit a supermarket with their teacher. The teacher asks students to observe different products. Where they come from, whether they are organic or not, how they are processed, what packaging they have, if they are seasonal or not. Then they discuss about how all the above affect the Ecological Footprint.

This "detective" activity is attractive because it is exciting to explore products on a totally different focus as usually: It can be carried out in almost **all living-places** and during **the whole year.**

Target: The excursion should facilitate to consume critically

Target group: Age 10–13 and 14–18 years old (the description provides the tasks for 10–18 years, with the hint "advanced" if it could be just for the elder ones); for the whole class (depending on the shop size; especially for small shops please ask the owner)

Preparation: Ask the store manager (in advance) if this survey on the Ecological Footprint can be done. To avoid any inconvenience, communicate important rules to the students (only small groups, give other customers room, no noise, no running, meeting point after x minutes outside the store etc.)

It is ideal to choose a shop/supermarket which can be reached by walking, cycling or at least, by using any form of public transport.

It is recommended to have at least the inputs of Learning Unit 3 "The Ecological Footprint of Nutrition" provided by the eco-foot project, if focusing on nutrition aspects. Otherwise give a short introduction to the "lesson already learned" that is needed for the exercises. For more details on energy consumption the content of Learning Unit 4 "The Ecological Footprint of Housing" would be helpful. If mobility to the supermarket is of special interest, it would be helpful to work with Learning Unit 5 "The Ecological Footprint of Mobility". General aspects on consumption can be found in LU6 "The Ecological Footprint of Other Consumption".

Duration of activity: 2–4 hours per session (half day, depending on how far away the supermarket is and how detailed the tasks or the discussion)

Discussion: after the survey in the shop the students should gather for the presentation of the results (e.g. in the park near the supermarket or in classroom). Room for a discussion is especially important, so that all groups get to know the results of other tasks and bring their point of view (or good experience of their consumption habits already implemented in their family-life) into the discourse.

Required materials: writing utensils, mobile phone (google maps; find the right season app) or similar offline material

The ecological value of the activity: It leads the students to a critical view of different products in a supermarket according to their Ecological Footprint and other important criteria like e.g. fair trade, regionality, right season, packaging, energy losses. **This extra time in a supermarket – without the need to buy something – could influence the rest of the life's consumption habits!**

Course of action: Groups of 3–5 students fulfil one or more of the following tasks:

A. Lesson already learned: **Animal products have a large footprint!**

Task 1: **Analyse (one of) the following product categories and find the 3 most stunning items** (e.g. where you learned something, best of category, lowest price as well …) for

- **a)** No animal product included (VEGAN)
- **b)** Little animal product included
- **c)** One of the main ingredients is an animal product
- **d)** a) b) c) + organic
- **e)** a) b) c) + fair trade
- **f)** a) b) c) + organic + fair trade
- **g)** a) b) c) + organic + fair trade + from your region/country

Additional Questions to be answered:

- What kind of products need extra energy for cooling or heating?
- Are the cooling systems state of the art? (e.g. noise, energy losses, arrangement (e.g. doors for freezer, horizontal or vertical doors[1] …)
- Are there any differences in packaging due to products with or without animal products (in general)? And mention some good and bad examples due to packaging.

Examples for product categories:

- Sweets
- Cooled Goods
- Ice cream
- Snacks (including baked goods)
- Prepared meals

Task 2 (middle): **Differentiate in**

- **i.** Egg
- **ii.** Milk
- **iii.** Yoghurt
- **iv.** Curd
- **v.** Meat

TIPP: Younger students should get a special task: " Look at Sweets & the animal product egg and milk". Older students could work on the mentioned examples in Task 2 systematically (for one product category or more)

Task 3 (advanced): Are there products that substitute animal products with plant-based ingredients?

Task 4 (advanced): Compare 2 or more shops! Interesting would be the different aspects and products on a classical supermarket (big one), a smaller shop and a "tiny organic shop" could be analysed.

[1] Refrigerated shelves that do not have doors have large cold losses. Refrigerated shelves with vertical doors only lose a lot of cold when opened. Refrigerated cabinets with horizontal doors have the lowest cold losses and are the most energy-efficient.

Inspiration for the discussion:

- Present your findings / What are your findings?
- What kind of products include animal products and you wouldn't expect it?
- Do you have doubts on the quality "of the secret ingredient" for any kind of animal product? (e.g. quality of eggs in noodles; any hint of their quality as they exist for eggs if you buy them directly?)
- Did you find products that fulfil all criteria (e.g. for f) or g)) and if so, what was the share in the category? One out of 10 products, or less?
- How can a better/the best product of a category reach a higher share in the shelf? (e.g. more people buy them, other get more expensive due to their higher footprint …)

B. <u>Lesson already learned: Importance of right season > organic > regional and fair trade always important!</u>

Task 1

Analyse (one of) the following product categories and find if possible 3 examples for:

a) In the right season of your region
b) In the right season of your region & organic
c) In the right season of your country
d) Not in the right season (from Europe)
e) Not in the right season (from Overseas)
f) Products that are fair trade
g) Product that fulfil the criteria b) + f) or c) + f)

Additional Questions to be answered:

- Are there differences in quality from products from the right season and imported products?
- What are the disadvantages of products bought not in the right season? (e.g. quality, transport, …)
- Which products would you recommend to buy now? What about bananas? (e.g. for bananas the transport by ship and lorry is very efficient, compared to a shopping trip by car!)

Task 2 (advanced)

Find out the distance from the shop to the country / place of origin of the product. Use google maps, atlas, or maps to figure out the distances to the land of origin. Mention at least 3 interesting ones coming from the region/country or from abroad.

Task 3 (advanced):

Compare 2 or more shops! Interesting would be the different aspects and products on a classical supermarket (big one), a smaller shop and a "tiny organic shop".
Examples for product categories:

- Vegetables
- Fruits

TIPP:

1) To find out the right season, there are online tools to be explored! Part of the result or a preparation/homework to the excursion could

be to find „The best app to check the right season of a product in a certain country".

2) Explain maturation: Plants need a lot of time, sun and water for their fruits to ripen. During this process, green fruits turn into brightly coloured fruits and form a sweetish smell and taste. During the ripening process, valuable vitamins are produced. Therefore, it is so important to let the fruits ripen on the plants long enough. Ripe apples, for example, contain significantly more vitamin C than unripe fruits.

For the discussion:

- Present your findings / What are your findings?
  - **a)** Products & examples including proper comments
  - **b)** Questions

- What are the lessons learned for you?
  - Did you find products that fulfil all criteria and if so, what was the share in the category? One out of 10 products or less?
  - How can the "Best of Products" reach a higher share in the shelf?
  - What kind of fruit and vegetables are on offer in the supermarket all year round?
  - Why do we still often buy fruit and vegetables that are not in season? (e.g. is sometimes even cheaper, has more prestige value "I can afford ananas for Christmas", people do not even think about it, differences in taste are not important to people, ...)
  - How did you/can you prove the fair trade from a product coming from your region?
  - How does the presentation of the product influence the selection of the products for the consumer? (Advanced: in advertisement material, at shelf?)
  - Why do the offers in individual shops differ?
  - What would be the worst case, when transporting products (Flight transport and the transport with the car from shop to your apartment!) -> Any hint on the product according to flight transport?

Example 5 Traffic counting

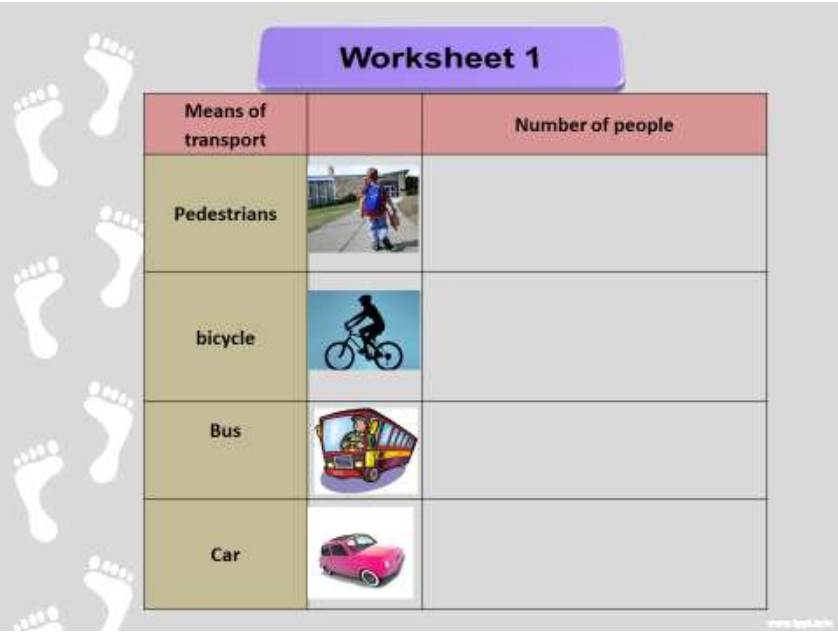
This excursion can be connected to Unit 5 Mobility

What can be done during the excursion "Traffic counting – Excursion to the city"?

Students and their teacher visit a central spot nearby a crossing, where motorized traffic is heavy.
The teacher asks students to observe how people move around and count the means of transport in this central spot of the city.
They prepare the following worksheets to record the means of transport and the number of people in them.

Worksheet 1

Means of transport		Number of people
Pedestrians		
bicycle		
Bus		
Car		



Worksheet 1

Means of transport		Number of people
Pedestrians		
bicycle		
Bus		
Car		

Worksheet 2

	Number of people in the car
One person	
Two people	
Three people	
Four people	
Five people	

The field study is followed by a discussion about how all the above affect the Ecological Footprint and for example the average occupancy level of cars is calculated. How than could the footprint per person be cut in half? Etc.

Example 6 Afforestation campaign

This excursion can be connected to all Units.

What can be done during the excursion "Afforestation campaign"?

The activity can be carried out in a forested area, on the outskirts of the city, on a piece of land, identified together with the town hall, the forest authorities or an NGO. Planting activities take normally place **in spring, in March and early April**.

The group can consist of 15–20 students, between 14–18 years old and at least 2 teachers (one of them, or both, should have a background in the area of environmental protection / biology / forestry). Collaborations with forestry, landscape and land improvement professionals are welcome.

The group will use, as far as possible, non-polluting means of transportation (depending on the distance: on foot, by bicycle, train, bus or other form of public transport).

The activity lasts at least 4 hours (plus travel time)

In most cases, afforestation works are carried out at distance from inhabited areas. In this situation, first aid kits are recommended.

Materials required: seedlings, tools (shovels, pick ...) gloves, buckets, clothing and footwear for a sloping, degraded land, and for the changing spring weather.

During the action:
The activity is carried out with volunteer students, and can be combined with a trip to visit the surroundings, hiking in nature, picnic or other recreational activities.

The specialized coordinating teacher will establish beforehand with the owners of the land which part will be afforested: the surface, the species of used seedlings and their disposition, the purchase of the necessary materials and the approximate duration of the activity.

In the morning, on the field, the accompanying teachers, together with the collaborators will divide the students into working groups, establish the activity areas, do the training for the use of tools and equipment in safety conditions, explain the work and supervise the students.

The specialized training is unfolded by the representative of the partner who organizes the afforestation work, and the monitoring of the works is done by him along with the teaching staff accompanying the group.

It will work for example in teams of 3 students each – one digs the pit, the others plant the seedlings.

They will perform the specific planting tasks:

- Digging the pits – the separation of the fertile soil from the top layer to the bottom layer is necessary
- Positioning the seedlings, after clearing the soil from the bottom of the pit, cleaning up the insects and harmful larvae
- Covering the ground roots: first, a layer of the fertile soil from above, then, positioning of the roots, then the rest of the soil, tamping the material by foot, then – a layer of loose soil on the surface, to allow water to circulate.
- Watering (if possible).

Results

By this activity participants can cultivate:

- Team work
- Communication within a team
- Solving practical problems encountered during an activity
- Helping each other
- Responsibility for their actions

At the end of the activity, the wooded area – the number of seedlings planted – will be measured using Google maps, if the area has signal coverage for mobile Internet or other specific means. Thus, the amount of oxygen released into the atmosphere by the trees, at maturity, can be estimated.

Ideally, students should mount a sign on the afforestation, to raise awareness and appeal for the protection of the area.

Some return actions can be taken into the area, following the development stage of the seedlings, possibly supplementing them.

Positive effects of maintaining a sustainable forest ecosystem:

Forested areas contribute to a normal circuit of the chemical elements in nature. The plants provide oxygen and absorb carbon dioxide (which they store in the wood mass along with other chemical elements taken from the soil).

During the photosynthesis process, 1 ha of forest absorbs about 16 tons of CO_2 and produces 30 tons of O_2 annually on average[2] (the amount varies region-specific and depends on forest conditions and tree population). Trees also retain dust produced by industrial or transportation activities.

Only the fires affect every year about 12–13 million ha forest, thus emitting impressive amounts of CO_2 into the atmosphere.

The roots of the trees fix the soil, especially on the slopes, decreasing the probability of landslides and land collapses; prevent soil degradation by salting or swamping.

Forests contribute to soil formation by: crushing the rocks (mechanical action of the roots), alteration of the rocks (chemical action), humus formation and ensuring fertility (by organic substances released).

Leaves of the trees retain 40–50% of the precipitation amount; the roots of the trees loosen the soil which can hold more water; the forest maintains the high level of water in the soil and the quality of the groundwater (water deposits); reduces the risk of flooding.

Depending on the species of trees, their height and density, the forest moderates the temperature regime (in summer, in the forest it is about 2 ^{o}C cooler than outside, and in winter the temperature is 1.7 ^{o}C higher in the forest than outside).

Due to the intense evapotranspiration, a stream of moist rising air is created above the forest, which increases the nebula; the distribution of precipitations changes and the humidity increases locally; the wind speed is reduced; it keeps the snow layer longer: it reduces the amount of radiation that reaches the ground because it absorbs them in the process of photosynthesis.

[2] http://greenly.ro/biodiversitate/21-martie-ziua-internationala-a-padurii (translated)

Example 7 Collection of waste

This excursion can be connected to Unit 6 Other Consumption.

What can be done during the excursion "Collecting waste selectively from any outdoor areas (forest, park, town outskirts)":

Target group (age, ideal number): Around 25 pupils, 13–17 years old

Duration of the activity: 3–4 hours per session (half day)

Required materials: Protective gloves, household bags, scales, charts, cameras (could be the students' smart phones).

It is ideal to choose an area which can be reached by walking, cycling or at least, by using any form of public transport. The collected waste amounts must be taken by a specialised company (recycling, municipal services, or others).

The teacher should explain specific terms and conditions: waste, selective collection, reduction, reuse, recovery, recycling.

Hypothesis:

Wastes have a strong impact on the environment, and recycling or reducing their volume has as a consequence a lower pollution rate. By collecting selectively, we save energy, reduce pollution, conserve natural resources and thus, reduce the Ecological Footprint!

The ecological value of the activity:

- It leads the students in the spirit of respecting the natural environment and the natural balance through the practical activities of waste collection;
- It forms habits of preserving cleanliness in places where they carry out their activities, showing respect for future generations, which will also benefit from a clean, natural environment;
- It raises awareness on the negative effects of the accumulation of waste and how the quality of the environment and the quality of life can be influenced positively;
- It forms the ability to read labels on packaging to understand what materials are made of them and how they can be recycled.

The action concerns two components:

First one is the outdoor activity, when students go in the chosen land area, split into working teams, get gloves, waste bags and **collect the garbage, selecting it by components**.

Each group will weigh the amount of plastic, paper, metal and other waste they collected, using the following table:

Material	Quantity (kg)
Plastic	
Paper-cardboard	
Glass	
Aluminium	
Iron	
Other (unsorted)	

The second part, the debriefing, will be done **in the classroom**, next day or few days later, when pupils will analyse the consequences of the waste pollution, on the one hand, as well as the importance of their actions. Also, they can make a collage of pictures they had realised at the activity, to be exposed on a special corner in the classroom/school lobby.

It is recommended that students return in these areas, for a follow-up. On these occasions, students can design, execute and fix some banners in the cleaned areas.

Good to know!

- To produce a ton of paper, up to 5 trees with a venerable age of 80–100 years are required. They recycle in an hour the oxygen that 320 people need.
- Recycling one ton of plastic saves 1.8 tons of oil and gains 6 m^3 of space for waste storage.
- A TV can operate for 3 hours with the energy saved by recycling one aluminium can.
- For the manufacture of one kg of plastic material, approximately 2 kg of oil and significant energy quantities are used.
- Plastics` recycling reduces 2 to 2.5 times the generation of CO_2.[3]
- From 10 recycled plastic bottles you can make a shirt or square meter of carpet, and from 50 plastic bottles, a sweater can be made.
- Each ton of recycled paper saves 17 trees.
- - Recycled paper has only 1/5 of the ecological footprint of virgin fibre paper
- By recycling a ton of glass, we save 1.2 tons of raw materials (soda, sand, and feldspar) and the used fuel.

After the activity, report by the pupils:

Estimate, using the data from each groups' table and the information, provided by the teacher:

a) How many litres of crude oil have we saved and how many kilograms/tons of CO_2 have we prevented from reaching the atmosphere;
b) Number of mature trees saved from cutting it down;
c) How many plus hours of television operation is possible with the collected aluminium cans

[3] https://www.innovasjonnorge.no/globalassets/eea-grants/romania/ro-energy/energy-audit-call-for-proposals/er_6-conversion-guidelines-ghg_energy-audit_v0.2-14.03.2019.pdf

Further ideas – contact us!

Other excursions fit our Ecological Footprint training too!

Maybe you have own ideas matching the regional conditions.

If we can help you with more inspiration or reports on previous experiences, visit our website **www.e-co-foot.eu** for contact data.