



**PLANET  
CHANGE**

# Deforestation: What's happening in our forests?

Teachers' manual



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**Planet change** is the short name of an EU Erasmus+ project aimed at VET teachers and their students. With small activities, the idea is to create awareness about sustainability and acquire 21st century skills. All this is done in a technical context, mostly from space technology.

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# 1. General information

**Duration:** 180min (could be divided into two or more separate lessons)

**Target group:** 16/18 years old

**European qualifications framework level:** 3-4

**Teacher preparation:** Read the background information and provide the necessary materials (including printing documents if necessary – [see the activity with the country cards](#)). Also, before starting the activity, teachers should have contacted with all the materials available and experimented using the software suggested. For the Google Earth Pro, there is already a tutorial prepared by the project partners which can be used to get familiarised with it, and tutorials about Global Forest Watch Map can also be found on their official website: <https://www.globalforestwatch.org/help/>.

## Topic

**Themes:** climate change; deforestation; forest protection

**Keywords:** climate change; deforestation; forest degradation; forest loss; land use; forest protection

## Activity

### Goals

This activity intends to raise awareness among students about the problem of deforestation and to make them understand that it is a universal issue - not only because it happens in nearly all countries, but because it affects us all. Moreover, the activity intends to show students how science space can be useful for the topic of deforestation, how it allows us to access up-to-date information and see the problem for ourselves and also wants to motivate students to reflect on what they can do, on a local level, to help to tackle this global problem. They will understand how satellite images are important to track deforestation, observe the evolution of land uses and deforestation problems over the years, and what could be the main causes and consequences of it to a particular place. It is expected that students will also develop a series of crucial 21st century skills, such as critical thinking, media and information literacy, teamwork, and creative thinking.

### Summary

This activity aims to raise awareness about the problem of deforestation, and its prevalence and extension, to counter the common belief that forest destruction is something that is happening extremely far away. In this sense, we aim at making young people realise that this is a problem that we all share, by engaging them with the problem of deforestation in their own countries and reflecting on ways to minimise it. Nevertheless, students will also learn



that although deforestation is a wide problem, its actual materialisation and causes and effects may vary significantly. In this activity, students will gain awareness and knowledge about forest changes, of deforestation's many causes, and understand that many times, these problems are related to human action (such as excessive urbanisation, diets relying on animal products, and certain professional activities...). Then, they will reflect on what they can do to help minimise a problem that often seems so distant and overwhelming.



## 2. Introduction

Deforestation is the permanent removal of forests or woodlands to use the land for non-forest purposes, such as agriculture, mining, or urban development, and it's a significant environmental issue with far-reaching impacts on both the planet and the people who depend on forests for their livelihoods. As we all know, forests are crucial for the existence of life, as they regulate the Earth's climate by storing carbon dioxide and producing oxygen, apart from constituting habitats for plants and animals.

Nonetheless, deforestation, which is an increasing problem, poses a threat to all these benefits - when forests are cleared, the stored carbon is released into the atmosphere, contributing to climate change, the emission of oxygen lowers, and the destruction of habitats puts many species at risk of extinction. It should also be noted, also, that deforestation can have a negative social impact as well, as it can force Indigenous communities to move and lose their traditions and cultural behaviours, which are often connected to forests and natural life.

While the problem is not new, it has been significantly aggravated in the last decade: according to existing data, "over the decade since 2010, the net loss in forests globally was 4.7 million hectares per year.<sup>1</sup> However, deforestation rates were significantly higher. The UN FAO estimates that 10 million hectares of forest are cut down each year" ([Our World in Data](#)).

Before pointing out why we lose trees, we should also distinguish between deforestation and forest degradation. The first term refers to the total removal of trees to make way for other land uses. This results in a permanent conversion of forest into another type of land use, with no expectation of regrowth of trees. On the other hand, forest degradation describes a thinning of the forest canopy or a reduction in tree density in a particular area without any change in land use. These changes are typically temporary, and it is expected that the forest will regrow. The main reasons for these two phenomena are:

- **Deforestation:** conversion of forests to agricultural uses (such as palm oil), mining or building of energy infrastructure and urbanisation
- **Forest degradation:** shifting agriculture, use of forests for products such as timber and paper, and wildfires

However, we should also keep in mind that the duration and frequency of forest degradation can very easily lead to a permanent problem of deforestation - that's why we need to be very aware of all the causes of tree loss and reflect on how we can help.

## 3. Description of the activity

The core of the activity is to explore the problem of deforestation in various locations and using different digital tools. Students will use [Google Earth Pro](#) and [Global Forest Watch Map](#) for this activity. As an addition, and if the activity is being implemented solely online, students can make use of a digital shared board where they can place collaboratively their answers (e.g. Mentimeter, Jamboard). Apart from that, they will need access to the Internet, not only to use the software mentioned but also to search for additional information and data.



In terms of structure, this activity is divided into four parts:

1. Introduction to deforestation
2. Looking down from space
3. The scope and extension of the deforestation problem
4. Reflection and next steps

## Part 1: Introduction to Deforestation (30 min)

### Initial discussion on deforestation

Teachers can start the activity by implementing an open discussion session, asking “Do you know which countries suffer the most from deforestation?”. They can discuss the topic freely and write, for example, their guesses on the board. Next, the teacher can continue by asking “And what about what causes it? Do you have any idea? Students should be encouraged to exchange ideas and discuss together.

### Guessing the country through deforestation facts

Step 1: Teachers can start the activity by implementing an open discussion session, asking “Do you know which countries suffer the most from deforestation?”. They can discuss the topic freely and write, for example, their guesses on the board. Next, the teacher can continue by asking “And what about what causes it? Do you have any idea? Students should be encouraged to exchange ideas and discuss together.

Step 2: Teachers should prepare “country cards” with information about deforestation. For that, they will need to:

- Go to [Global Forest Watch](https://www.planetchange.eu/global-forest-watch) and select a country to analyse. For that, they can click on the tab “Map” and then click on any country they want to see the details of. A column saying “Analysis” will appear. Normally, some filters are already selected (in this case, the “Forest Change” and “Land Cover,” and, therefore, information on those topics is already presented.



Example for the country “Spain.”



- Inside each one of these areas, there is a lot of filters to choose from. Teachers should start with selecting **Forest Change > Tree Cover Loss and Tree Cover Gain, Tree cover loss due to fires and Tree cover loss by dominant driver** (note: this last filter allows teachers and students to see which drivers are leading to, in fact, deforestation: wildfires, shifting agriculture, etc., from 2001 to 2023).

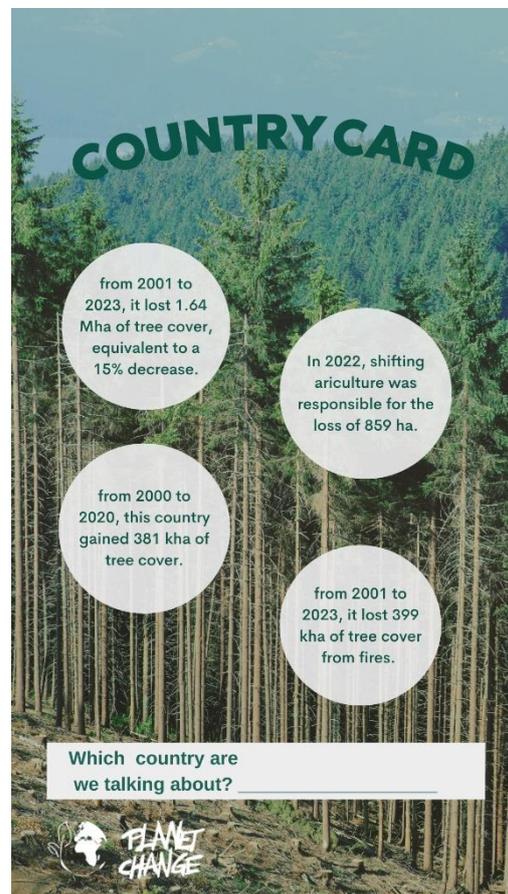
Based on this example, the “Country Card” for Spain would be like this (can be adapted according to teachers’ preferences):

### TREE COVER CHANGE

- Tree cover gain i  
20 years, 30 m, global,  
Hansen/UMD/Google/USGS/NASA
- Tree cover loss i  
annual, 30 m, global,  
Hansen/UMD/Google/USGS/NASA

### FIRES

- Fire Alerts (VIIRS) i  
daily, 375 m, global, NASA
- Tree cover loss due to fires i  
annual, 30 m, global, UMD/GLAD
- Global Fire Weather Index i  
NASA/GFWED
- Global Air Quality Index i  
World Air Quality Index Project
- Tree cover loss by dominant driver i  
2001-2023, 10 km, global,  
Hansen/UMD/Google/USGS/NASA



Teachers can find the editable template, to adapt it to other countries, [here](#).



**Important:** please note that not all filters are available in all geographical regions. To avoid that students get confused, teachers should check first if the filters they want to manage are available in the countries chosen. This information can be checked by clicking in the “i” symbol next to the filter.

**Step 3:** Students can work on pairs or alone (depending on the organisation of the lesson and the number of country cards produced), and try to guess, based on what they know, which country they have in front of them. Afterwards, recurring to the Global Forest Map or other resources, they should try to find out. If after a while they cannot find out, the teachers should reveal the answer.

## Part 2. Looking down from space (60 min)

### Preparation

Students should be divided into two groups (A and B) - one of them is going to analyse a region in one country, the other in another country (preferably in another continent).

Here, we will take Brazil and Portugal as examples, but the activity should be adapted to the countries teacher prefer to analyse with the student.

Students should install [Google Earth Pro](https://www.google.com/intl/en/earth/versions/#earth-pro) on their computer or tablet. It can be downloaded through this link: <https://www.google.com/intl/en/earth/versions/#earth-pro>. In case of any doubt, you can take a look at the tutorial provided [here](#). For the first part of this activity, which is dedicated to the role of satellites in environment monitoring and protection, we will draw closely on the first steps of the tutorial. It should be noted that this activity can be implemented together with the “Salmon and Rainforest” one, which belongs to the Agriculture topic.

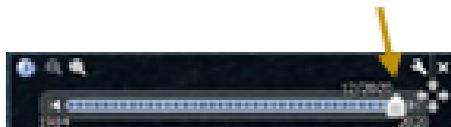
### The role of satellites in environment monitoring and protection

Now that they already opened Google Earth Pro on your device, let’s explore it a little bit, so we can understand how satellites can help us understand what is happening down on the Earth. As mentioned, students should be divided into two groups, A and B, each one of them taking a country to explore.

#### Group A. Let’s look into Brazil!

**Step 1:** In the search bar, start by writing “Pará” (Brazil). Go to the place. You can move around the area by dragging the mouse while holding down the left button and zoom in/out using the mouse wheel or the buttons on the right side of the screen.

- As you see, this is one of the regions of Brazil which is encompassed by the Amazon forest. You will try to see what was been happening in this area regarding the forest.
- In order to do that, access older satellite images by clicking on the historical images tool  . A small window will appear. Each vertical line indicates a previous image. Drag the pointer to the different positions to see the historical images.



**Step 2:** Try to answer the following questions, using the knowledge you already have on the topic. Later, you will have the chance to investigate deeper.

- What seems to have happened in the area?
- Can you list the main changes happening between 2001, 2010, 2015 and 2020?
- Do you know some of the reasons for what happened?

*PS: If you want to measure some area (e.g. the area of the forest before vs. now, you can use the measure tool:*



*To measure a distance, select the line tab and click with the right button on the initial and final points. You can also measure the area and perimeter of an area by using the polygon tab.*

**Step 4:** Write down your thoughts and prepare yourself to present them to your colleagues.

### Group B. Let's look into Portugal!

**Step 1:** In the search bar, start by writing "Coimbra" (Portugal). Go to the place. You can move around the area by dragging the mouse while holding down the left button and zoom in/out using the mouse wheel or the buttons on the right side of the screen.

- As you see, this is one of the regions of Portugal that has a wide green area. In fact, it is also one of the regions that has been more affected by forest changes in recent years. You will try to see what was been happening.
- In order to do that, access to older satellite images by clicking on the historical images tool . A small window will appear. Each vertical line indicates a previous image. Drag the pointer to the different positions to see the historical images.



**Step 2:** Try to answer the following questions, using the knowledge you already have on the topic. Later, you will have the chance to investigate deeper.

- What seems to have happened in the area?
- Can you list the main changes happening between 2001, 2010, 2015 and 2020?
- Do you know some of the reasons for what happened?

*PS: If you want to measure some area (e.g. the area of the forest before vs. now, you can use the measure tool:*



*To measure a distance, select the line tab and click with the right button on the initial and final points. You can also measure the area and perimeter of an area by using the polygon tab.*

**Step 4:** Write down your thoughts and prepare yourself to present them to your colleagues.



### Final discussion

After finishing their group work, students should be reunited and discuss their findings, uncovering the similarities and differences between them:

- What are the main differences and similarities between the changes that occurred in the two countries?
- Do you think that the reasons for the occurrences in the two territories are the same?

## Part 3: The scope and extension of the deforestation problem (60 min)

Now that we looked, from space, at two countries so far away from each other, and tried to understand what happened in their forests, we will uncover the truth! Once again, it should be noted that the two countries analysed were just examples; others can be chosen (and more than two, as well, so the following steps can be adapted accordingly).

Students can be, once again, divided into two groups, and each one should be responsible for one of the regions (they can choose the one they didn't work on before, in order to make the work more diverse). **The explanation that follows is an example, adapted to just one of the countries; the same steps are applicable to all the groups/countries analysed.**

### Analysing forest change, land cover and land use

Step 1: First, students should go to the [Global Forest Watch](#) and try to find roughly the same areas that they explored before in Google Earth Pro. They should click on the country, as the example below shows:



Then, the teacher should explain that they will focus on different dimensions of forests (available on the left column) – in this case, the topics chosen should be **Forest Change, Land Cover, Land Use**.

*Note: it might be useful to turn off the previous filters as you add new ones, to facilitate the visualization in the map.*

Step 2: In the **Forest Change** tab, they should analyse:



- a) Tree Cover loss
- b) Tree Cover Gain
- c) Tree Cover Loss due to Fires
- d) Tree Cover Loss by Dominant Driver

They should take notes of how much tree cover the country lost and gained in the mentioned period, which part of that loss was caused by fires, and, lastly, use the filter “Tree Cover loss by dominant driver”, which is very interesting as it allows to see which drivers are leading to, in fact, deforestation: wildfires, shifting agriculture, etc., from 2001 to 2023).

**Step 3:** Fires might be a huge problem and one of the major factors contributing to tree cover loss and deforestation, but they are not the only ones. When we talk about these problems, it is useful to understand what our land is being used for and how it contributes to deforestation. After seeing the main factors for it, students should explore, more in specific, what is happening to the land, by going to the “Land Cover.”

In the **Land Cover** tab, students should analyse:

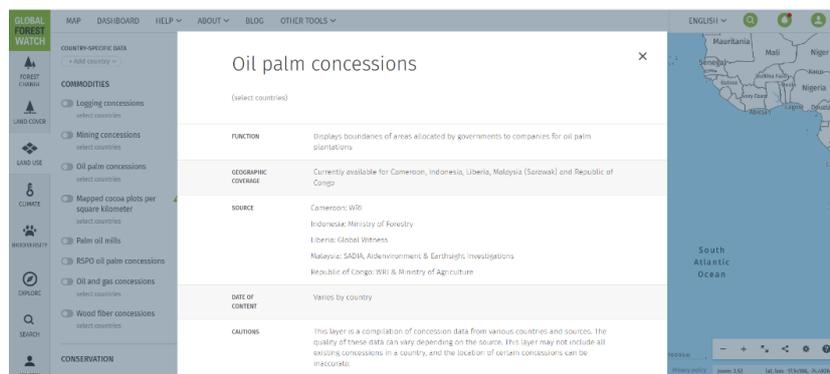
- a) Intact Forest Landscapes
- b) Land Cover

**Step 4:** Now, students, already having a better understanding of how much of the land is being used or not, they can see and examine the main objectives it is being used for, and how that can contribute to deforestation.

In the **Land Use** tab, students should analyse:

- a) Palm oil mills
- b) Protected areas

Please note that this topic is still under development, and therefore, there is not information for all countries. In that sense, some of the filters are limited to some countries. To check if you can ask students to apply a certain filter, click on the symbol “i” next to filter and see if it says whether “Global” – and, in that case, it is available to all countries – or if it available in limited countries – and in that case, see if you use them with the students, depending on the countries chosen. Here, for a matter of exemplification, we chose only the ones that are “global.”



Oil palm concessions	
FUNCTION	Displays boundaries of areas allocated by governments to companies for oil palm plantations
GEOGRAPHIC COVERAGE	Currently available for Cameroon, Indonesia, Liberia, Malaysia (Sarawak) and Republic of Congo
SOURCE	Cameroon: WRI Indonesia: Ministry of Forestry Liberia: Global Witness Malaysia: SASIA, Akademia & Earthgigs Investigations Republic of Congo: WRI & Ministry of Agriculture
DATE OF CONTENT	Varies by country
CAUTIONS	This layer is a compilation of concession data from various countries and sources. The quality of these data can vary depending on the source. This layer may not include all existing concessions in a country, and the location of certain concessions can be inaccurate



## Analysing the side effects of deforestation: loss of biodiversity and CO<sub>2</sub> emissions

Now they have investigated the possible main reasons for deforestation in the country you are analysing. They should also search for other online and offline resources to confirm the ideas and information you have or to find some new data.

Finally, students are going to consider some of the side effects of deforestation - the loss of biodiversity and the CO<sub>2</sub> emissions (just a note: they increase as deforestation increases as well!). To complement the activity, ask them to the “**Climate**” and “**Biodiversity**” tabs.

In the **Climate** tab, students should analyse:

- a) Forest greenhouse emissions

And in the **Biodiversity**, they should look for:

- b) Global biodiversity intactness

## Part 4. Reflection and next steps (30 min)

Step 1: After students gathered all this information for both countries, they should prepare a presentation (using a digital or offline board, a poster, or a PowerPoint - they are free to choose!) to show to their colleagues what they have found about the country they were working on. They can follow these questions as a guide:

What are your main conclusions? Show the data you collected regarding the tree cover loss and gain and explain the main reasons behind the problem.

- What conclusions do you have about land cover and land use? How does it relate to deforestation?
- What conclusions have you reached by connecting all these information on deforestation with then the effects on climate and biodiversity?
- What do you think about the information gathered? Did it surprise you? In what ways?
- If you were in charge, what would you do differently?

Step 2: Once all the information is gathered, students should reflect on their conclusions for each one of the countries and the teacher should guide the following discussion with your colleagues:

- What are the main differences and similarities between the two regions - regarding forest change, land use, land cover, climate, and biodiversity?
- Why do you think could be the reason for such similarities/differences?
- Think collectively: If you were in charge, what would you do differently?



## 4. Annex I: Materials

- Computer/smartphone/tablet with access to the Internet
- [Google Earth Pro](#) and [Global Forest Watch Map](#)
- Whiteboard/ cardboard or interactive boards (such as Padlet)
- Country Cards ([template](#))



## 5. Annex II: Background information and tutorials

### Further information / background:

- [The Tragedy Of Deforestation | Climate Change: The Facts | BBC Earth](#)
- [Deforestation – Causes, Effects and Solutions To Clearing of Forests](#)
- [Activity 4: Deforestation](#)

### Tutorials:

- [Google Earth Tutorial](#)
- [Global Forest Watch Map](#)

