

Unit 03

Landscape & Climate Change
Adaptation in Education

European Landscapes in a Changing Climate

INTRO: The role of landscapes in climate change adaptation and -mitigation. Get aware of the fact that landscapes are shaped by climate, but on the other hand landscapes also are key actors when it comes to developing strategies to cope with climate change.

AGE GROUP

12–15 years

DURATION

5 lessons
(5 × 45 min)

LINKS TO CURRICULUM

Geography

History

Biology

Physics

Chemistry

Legend

Layout orientation

Head with logo

Unit number

Unit name

Info about current page

Page content

Footer with web link, logos of partners, EU, current page & full page counter



Content icon

for teachers

for students

references

Phase of the Unit

gaining knowledge

analyzing

creating



Structure

Introduction

01

What is Landscape?

02

What does the Landscape Consist of?

03

European Landscape in a Changing Climate

History, Culture & Heritage

04

Agriculture Transforms the Landscape

05

Landscape as a Chronicle

06

Landscape through My Eyes

Landscape as a Resource

07

Tracing what We Eat

08

Landscape as a Source of Materials & Energy

09

Landscape is a Network

Nature Designs

10

River Landscape

11

Plants as Partners in the Challenge of Climate Change

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Where Landscape is Growing Wild

Humans Design

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How to Build a City? Urban Landscape

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Proximity Landscapes

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Into Action

European Landscapes in a Changing Climate

The Unit highlights connections between landscapes and climate. It discusses how climate is and has been shaping landscapes, but also how climate has been influencing humans in shaping their environments and adapt to them.

The concepts of “adaptation” and “mitigation” are introduced to pupils. They receive information on how landscapes may contribute to climate change adaptation/mitigation and are encouraged to reflect on — and engage in — landscape-related strategies and measures for climate-fitness in their own home-landscapes. By introducing basic knowledge and raising awareness for the challenges of climate change the unit prepares the ground for further discussion of the topic in following EduScape-Units. The first section introduces to the concept of climate as an ever changing phenomenon and discusses the role of climate on shaping landscapes and influencing human life. Starting from basic knowledge on climate (in contrast to weather), activities raise awareness for the geographical and historical dimensions of climate and its changes in space and in time. Additional materials

provide information on the greenhouse effect and on the chemical-physical backgrounds and consequences of human-induced climate change. The second section lays a focus on historic changes in the European climate and its influences on landscapes and human societies. This section creates understanding for the deep connections between climate, landscapes and human societies from a historic perspective. This forms the groundwork for comprehension and contextualisation of the current climate crisis. The third section deals with the question, how landscapes — on the other hand — influence climate on the micro- and meso-level, and how we can actively contribute to climate change adaptation and mitigation by shaping and designing landscapes. Pupils learn about strategies and measures already identified and they discuss, which of them might be of importance in their home landscape.

AGE GROUP

11–15 years**ENVIRONMENT**

*Classroom/School Garden/
Landscape*

TIME REQUIRED

5 lessons (5 × 45 min)

LINKS TO THE CURRICULUM

*history, geography, biology,
physics, chemistry*

KEY WORDS

*adaptation, mitigation, climate,
weather, greenhouse effect*

GOALS

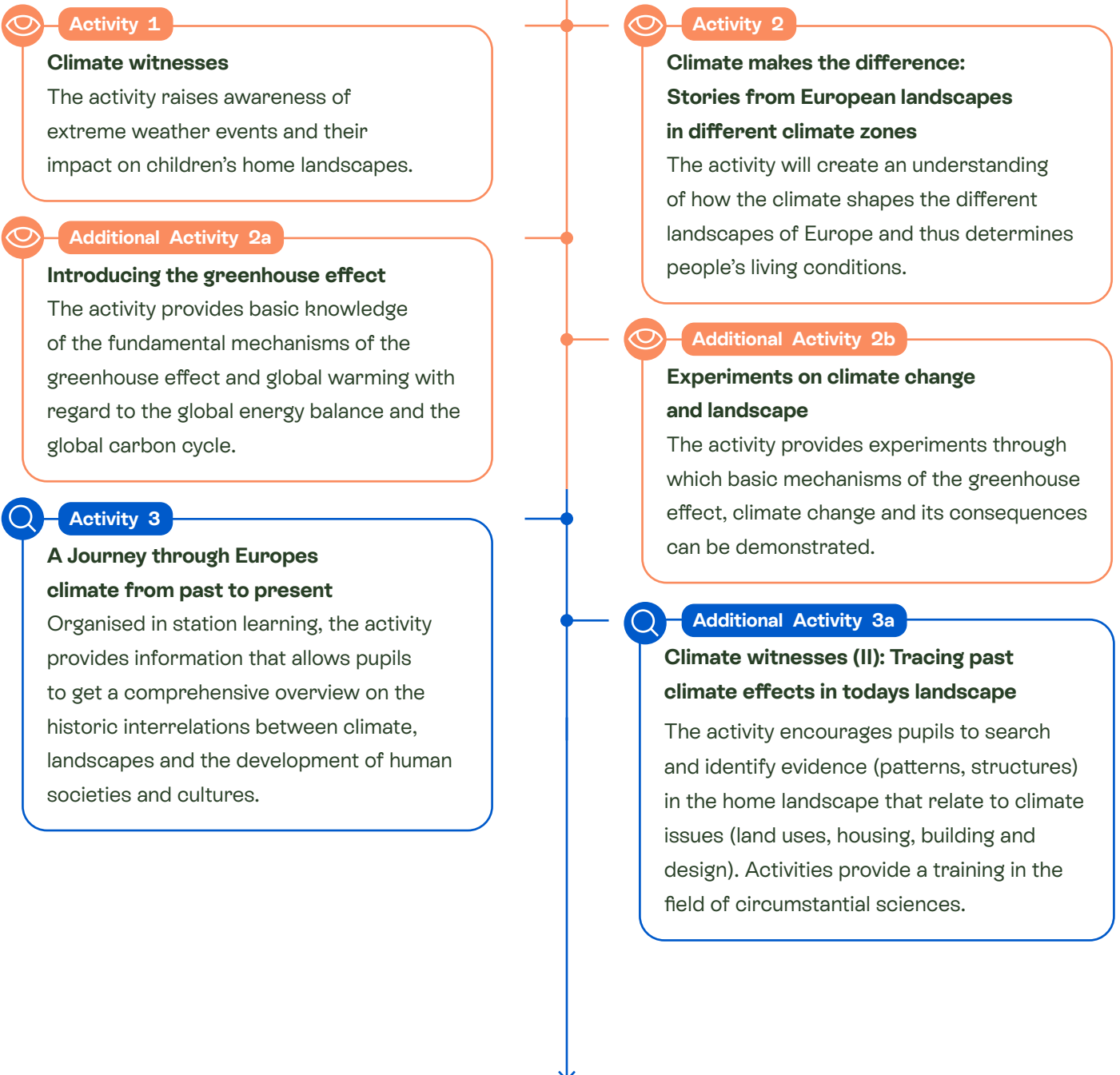
Pupils:

- know the scientific definition of climate and understand that climate is determining life on earth
- have a basic understanding of how climate influences the shaping of landscapes and human societies
- understand that humans – as well as all other living organisms – are forced to adapt to different climates
- get an understanding of the concepts of adaptation and mitigation and how they can help to survive and thrive in a changing climate
- comprehend how human activities can support landscapes to adapt to and mitigate climate change
- are able to explain different strategies for adaptation/mitigation and how they can be applied to a specific landscape.

INTENT – CONNECTION TO CLIMATE**CHANGE ADAPTATION AND MITIGATION**

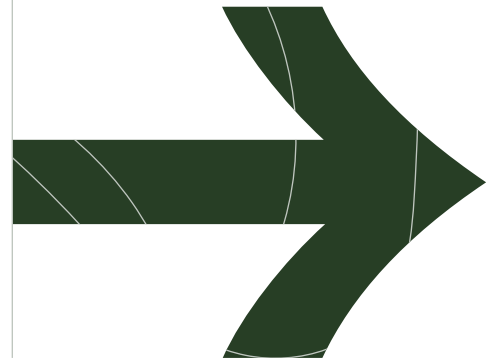
The Unit provides an problem-orientated overview on the field of climate change and the key role of landscapes in that field regarding questions of climate-related adaptation and mitigation.

European Landscapes in a Changing Climate





Activities for Students



Activity 1

**TIME REQUIRED:**

45 minutes,
flipped classroom:
preparations to be done
as a homework

AIM:

The pupils

- get aware that weather extremes and hazards are an integral part of human experiences
- understand, that those events take place unexpected and occasionally people have to be prepared and take measures
- get an impression of which climate-related impacts have an influence on their home landscape and how people have been dealing with those impacts.

TOOLS:

task-sheet with interview guideline, poster or digital surface for collecting and sorting the pupils' contributions, materials for basic knowledge on the concepts of climate and weather, possibly Vocabulary Sheet on the topics climate and weather

Climate witnesses

Description:

Pupils are requested to do research on regional experiences with extreme weathers and how they influenced peoples' lives and landscapes as a homework. Based on a task-sheet with guiding questions they do an interview with an older person (e.g. grandmother or grandfather) on their experiences with a natural hazard in the past. Pupils are commissioned to do additional research (internet, library) on the communicated events. The pupils edit the results from their investigations in a one-page-paper and bring it to class, where the results are presented, clustered and discussed. All contributions are arranged on a poster.

Step-by step schedule:

1. After a basic lesson on the topics of „climate“ and „weather“ (referring to the specific curricula) the teacher educates the class that in the following unit they would have an in-depth discussion on the topics „climate change“ and questions of adaptation to and mitigation of its effects. Therefore, pupils shall do the above described investigations as homework.
2. The teacher starts the lesson with a hint to the homework and encourages pupils to report on their results.
3. The pupils report one by one and their papers are pinned to a pinboard
4. The teacher gives a summary and in a next step, the group clusters the results (event type, place and time of occurrence, effects and consequences on people and landscape).
5. The teacher introduces the topic of the Unit: Climate change, its challenges, its possible impacts on our lives and environments and what we can do about it. The key concepts „adaptation“ and „mitigation“ are introduced and discussed in the plenum.
6. The lesson ends with a brainstorming: which are possible adaptations regarding the hazards reported by the witnesses? How could (have) the effects of the hazards been mitigated? If different types of hazards had been presented, the class could be divided into groups to elaborate their suggestions specifically.
7. The results are collected and inserted into the poster.

**Didactic info for teacher**

- Basic information on the concepts of „weather“ and „climate“ should be delivered ahead of the unit. It is also recommended to do the introduction EduScape-Unit on „What is landscape?“ in preparation for the Unit.
- The Unit functions as an introduction for further EduScape-Units, where single aspects of the topic are discussed in more detail

Activity 2

**TIME REQUIRED:**

45 minutes

AIM:

Pupils:

- are able to identify and describe the components of a climate diagram and how they interact
- are able to explain how diagrams can be used to understand the connection between climate and weather
- are able to interpret climate diagrams and use them to make predictions about climate and landscape
- comprehend how climate and landscape can be affected by climate changes in different regions

TOOLS:

- Photos of different European landscapes
- map of Europe with photos of landscapes in five different climate regions,
- audio-files (1-2min/climate region) and info-cards with short sequences, where people from five different regions of Europe tell about their lives according

Climate makes the difference: Stories from European landscapes in different climate zones

Description:

Pupils are guided to develop an understanding for the interrelationships between climate, landscape and the resulting living conditions and challenges in different regions of Europe. By comparing the conditions, they gain a deeper understanding for the parameters characterising a specific climate (temperature, precipitation and their seasonal patterns, causing periods of frost, heat, drought etc.). Pupils shall be able to characterise differences verbally by comparison and learn to read and interpret climate diagrams and get an understanding for their practical relevance.

Step-by step schedule:

1. The teacher starts the lesson by repeating basic information on the concept of climate. He/she engages the class in a discussion on the different impacts of climate on landscapes and asks the class to brainstorm some of the possible effects of climate change on landscapes, such as changes in temperature, precipitation, and land use. Further discussion could deal with the question how these changes can affect ecosystems and species. Additionally, the teacher can prepare some photos in a presentation that illustrate the discussed effects on various landscapes.
2. The teacher hints to the fact that climate changes regionally and introduces the topic of the lesson. He/she gives an instruction to the following activity that shall illustrate his/her statement.
3. The pupils listen to the stories by people from European landscapes one by one. The map with pictures of landscapes is placed in front of the class. After each story it is discussed, which information the speaking person shared. After that the pupils should find out where the person's home landscape could be placed on the map.
4. The class is divided into five groups, each group receives a work-sheet that includes a text of the story and a climate diagram of the region (secondary level) and guiding questions.
5. The teacher introduces the concept of the climate diagram, based on the information the pupils do an analysis of the diagram from the region they are working on. (The teacher can provide a climate diagram and explain how it can be used to understand the connection between



to the climates and the landscapes they are living in

- worksheets with information on five European climate diagrams

landscape and climate. The teacher can ask the class to identify the different components of the diagram and how they interact with each other. The teacher can ask the class to consider how different climates can be found in different parts of Europe.)

6. The five groups elaborate characteristics of „their“ landscapes, based on analysis of the climate diagram (regarding frost periods, snow-cover, heat and drought, duration of vegetation period, rainfall, fires); they identify relations to the presented pictures, discuss them and reflect on the role of climate for humans, how they adapt to climatic conditions and how this leaves traces in the landscape (building, agriculture, water management, hazard management etc.)
7. The groups present the results from their investigations
8. The teacher starts a discussion on comparing the five climate diagrams and the resulting impacts on landscapes and living conditions
9. Results from the comparison are merged in a tabular synopsis
10. The lesson ends with a discussion of possible challenges in the five regions due to climate change

Didactic info for teacher

- Basic information on the concept of the climate diagram shall be taken from textbooks on the topic.
- It is recommended to take the climate diagram of the home landscape as a starting point for comparison

Activity 2a

**TIME REQUIRED:**

45 minutes

AIM:

Pupils will learn that:

- The natural greenhouse effect is an essential prerequisite for life on earth
- Processes of industrialisation have been responsible for rising amounts of carbon dioxide in the atmosphere, which have begun to change the climate, these contain combustion of fossil fuels, deforestation, urbanisation and others.
- Global warming has become one of the major challenges for humankind, questions of adaptation and mitigation are a global issue, however, action on the local and regional level will equally be important to keep our livelihoods functioning.

TOOLS:

short film on the greenhouse effect: <https://www.youtube.com/watch?v=8CuqAN1zOPk>

Introducing the greenhouse effect

Description:

The pupils watch a short video on the greenhouse effect and on global warming (Earth receives its energy in the main from solar radiation, surface temperature is kept stable by a set of gases in the atmosphere that prevent parts of radiation from being reflected back to the cosmos. One of those gases is carbon dioxide, which is produced by volcanoes, but also by all living organisms within their living activities. Beyond, carbon dioxide is taken from the atmosphere by plants for photosynthesis to produce biomass. These processes have led to a dynamic equilibrium of carbon dioxide in the past and relatively stable temperatures – and climate – on earth; effects of fossil-based industrialisation on the climate)

The teacher introduces elements that influence near-ground climate by enhancing or mitigating overall climate effects; conducting simple experiments on the greenhouse effect, surface colour and radiation, evapotranspiration etc.

The role of landscape structure and landscape composition for the near-ground atmosphere is discussed

Activity 2b

**TIME REQUIRED:**

45 minutes

AIM:

Pupils grasp the basic mechanisms of the greenhouse effect, climate change and its consequences by conducting simple experiments.

TOOLS:

equipment for simple experiments, instructions for the experiments (see additional materials)

Experiments on climate change and landscape

Experiment 1:

How does the greenhouse effect work? Building a greenhouse?

Experiment 2:

How to show that CO² is a greenhouse gas?

Experiment 3:

What happens when glaciers melt?

Experiment 4:

How do melting glaciers affect the sea level?

Experiment 5:

How will global warming affect precipitation?

Experiment 6:

What are the effects of climate change on mountainous landscapes?

Activity 3

**TIME REQUIRED:**

90 minutes

AIM:

Pupils:

- will be able to identify and describe the climate of Europe from the Ice Age to the present day.
- can explain how the climate of Europe has changed over time, how this influenced landscapes, the living conditions and the development of the European societies
- can compare and contrast the climate of Europe in the past to the climate of Europe today.
- are able to discuss the impacts of current climate changes on Europe and the potential solutions to the problem.

TOOLS:

Maps, timeline, routing slip, six prepared stations with information on six climate periods in Europe after the ice-age

A Journey through Europe's climate from past to present

Description:

Double-lesson allows pupils to get a comprehensive overview on the interrelations between climate, landscapes and the development of human societies and cultures since the end of the ice age. It should sensitise them to the fact that climate has had a strong impact on cultural development, but humans – on the other hand – have also decisively and to an increasing extent – influenced the development of the climate. Both factors find their expression in landscapes. These insights shall form the groundwork for discussion on how we could find solutions for current climate-related challenges.

Step-by step schedule:

1. The teacher begins the lesson with a short summary of the previous one, hinting at the fact that climate not only spatially between regions and different climate zones, but also changes in time. To illustrate that, he/she provides a picture of a landscape from the ice age and a graphic that shows the average temperatures in Europe from the ice age to present. Pictures and charts are discussed on which information can be gained from them.
2. The teacher gives additional information on
 - A. how we can know that climate has changed in the shown way (methods of reconstruction from pollen profiles, ice cores, dendrochronology, varve chronology etc.) and
 - B. which are the possible reasons for a changing climate (solar activity, Milankovic cycles, atmospheric concentration of greenhouse gases etc.) He/she might introduce the concept of natural cycles and how they have affected the climate of Europe over time. Ask the class to consider how these natural cycles might have caused shifts in the climate of Europe and how they might be affected by human activities.
3. He/she asks the class to consider how the climate of Europe has changed from the Ice Age to the present day and the reasons why this might have happened.
4. The teacher introduces the programme for the upcoming lesson of station learning. The class is divided into six small groups, each group gets a routing slip and a copy of a timeline with a climate chart.



5. Each station is equipped with a sheet with basic information on a climate period and additional materials. Each group has 8 min. time at each station to elaborate the tasks defined in the routing slip and figure out where the characterised period is located at the timeline. Each group is asked to include information about the natural cycles and human activities that might have caused shifts in the climate over time.
6. Finally, the groups come together again in the plenum, the results are exchanged between groups and each group is asked to critically evaluate the other groups' results.
7. Each group gives a brief presentation that summarises the main effects of climate on landscape and society for one of the periods
8. In a final discussion the teacher asks for the main characteristics that distinguish the current climate period from the former. The group discusses the potential effects of climate change on Europe and how it might affect the lives of people living there. The teacher asks the class to consider how Europe might be able to address the problem of climate change and what solutions might be available.

Didactic info for teacher

An excellent material with vivid graphics on climate change can be found in the book:
Nelles, D. & Serrer, C. (2021): Small Gases, Big Effects: This is Climate Change. Particular Books

Activity 4

**TIME REQUIRED:**

45 minutes

AIM:

Pupils:

- know the concepts of „adaptation“ and „mitigation“ and are able to name different strategies of adaptation to/mitigation of climate change
- are able to reason certain aspects of adaptation and mitigation relevant for their home region

TOOLS:

Pin-board with index cards;

video „climate change

in Europe“ (6 min.):

<https://www.youtube.com/watch?v=8CuqAN1zOPk>,

Map „impacts of climate change in the different regions of Europe“; EduScape-poster with a schematised landscape; optionally: materials for quiz or mind-map

Local action against global warming

Description:

The lesson summarises the knowledge created throughout the Unit and organises argument, why this knowledge is an important foundation for engagement in the topic of climate change. By introducing the concepts of „mitigation“ and „adaptation“, a foundation for further problem-orientated investigations is laid.

Step-by-step schedule:

1. The teacher starts with a short summary of the previous Unit, recalling key insights on the development in European climate and its impact on landscapes and people. Factors influencing the climate are remembered, particularly for the youngest period. Already mentioned challenges of climate change are briefly addressed.
2. The teacher introduces the topic of the concluding lesson of this Unit: We will think about what we can do to mitigate the effects of climate change and to adapt to them?
3. As a start, a short video on climate change in Europe is shown. The pupils are asked to join in groups of two and summarise three effects on European landscapes mentioned in the film. *
4. Information is collected on a blackboard or on a pinboard.
5. Additionally, the teacher can present a map, where impacts of climate change in the different regions of Europe are displayed. Pupils are asked to identify their home-region on the map and study the mentioned impacts. Information is discussed and the collection on blackboard/pin-board is supplemented.
6. The teacher introduces the concepts of „mitigation“ and „adaptation“ and provides definitions of them and hints to the fact that the European Union as well as the member countries have prepared policies, promoting strategies for mitigation and for adaptation.
7. A brainstorming is conducted: Considering how climate change might affect the lives of people
 - A. what could be possible measures to mitigate the effects?
 - B. which to adapt to them in our home region?

Pupils first discuss in marble-groups of 2-3 persons and then bring in their suggestions in the plenum. (Depending on the time budget, the teacher could also ask pupils to do a quick research on the topic and



what solutions Europe might have to address the problem, and how Europe can mitigate the effects of climate change.)

8. Meanwhile the teacher pins a poster with a schematised EduScape-landscape on the wall, places the pin-cards with the definitions of „mitigation“ and „adaptation“ on it. Pupils' suggestions are written on pin-cards and pinned to the poster, either classifying them in the field of mitigation or adaptation.
9. The teacher tells the pupils that this will be their roadmap for further investigations in the topic and refers to the portfolio of the other EduScape Units, where materials and information can be found.
10. At the end of the lesson, as a reflection and evaluation the teacher can ask the class to complete a writing prompt that asks them to consider how European landscapes might be impacted by climate change in the future, what steps they might need to take to mitigate the effects and how adaptation and resilience strategies can be applied to the landscapes. Ask the pupils to consider the potential solutions to the problem of climate change and how Europe might be able to work together to address the issue. The teacher can also assign a quiz to assess the pupils' understanding of the concepts discussed in the lesson or let them create a mind-map on the topic.

* Alternatively, the teacher could provide Pupils with a worksheet that asks them to consider the potential impacts of climate change on Europe.

Didactic info for teacher

an extensive collection of information on the effect of climate change on European regions with tools and materials that should support regions in adaptation is to be found in

<https://climate-adapt.eea.europa.eu/en/>

The document: „**Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change**“, edited by the European Commission in 2021, provides information on how the European Union intends to actively support adaptation and mitigation activities in their member states.

Notes

Teachers should hint to the facts that:

...Landscapes are designed environments, design takes place in an ongoing interaction between humans, non-human actors (e.g. materials, plants, water) and natural forces.

...Landscapes provide the foundation for our everyday life, they serve our basic needs, containing the supply of resources, energy, housing and our activities.

...Climate is a major driving force in shaping the nature of a landscape, but as humans have to arrange with the climatic conditions of an area, it also provides the framework for all human activities.

...Rapid changes of the climate in the recent past urge immediate and extensive adaptations the pupils shall be confronted with.

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