VR COURSE

SECONDARY EDUCATION

Design Your Sustainable 3D Schoolyard!

Introduction

Students take on the role of an Engineer as they make a model of their sustainable school yard. They take on the work of a civil engineer as they plan the infrastructure (drainage, walkways, accessibility etc.) They get to know the work of landscape architects, focusing on aesthetics, usability, and environmental sustainability. They will propose sustainable solutions like rainwater management, eco-friendly materials and safe soil/air quality like environmental engineers do. Along the way, they will create 3d sustainable elements to be added to the proposed design of their school yard, which will be experienced in Virtual Reality.

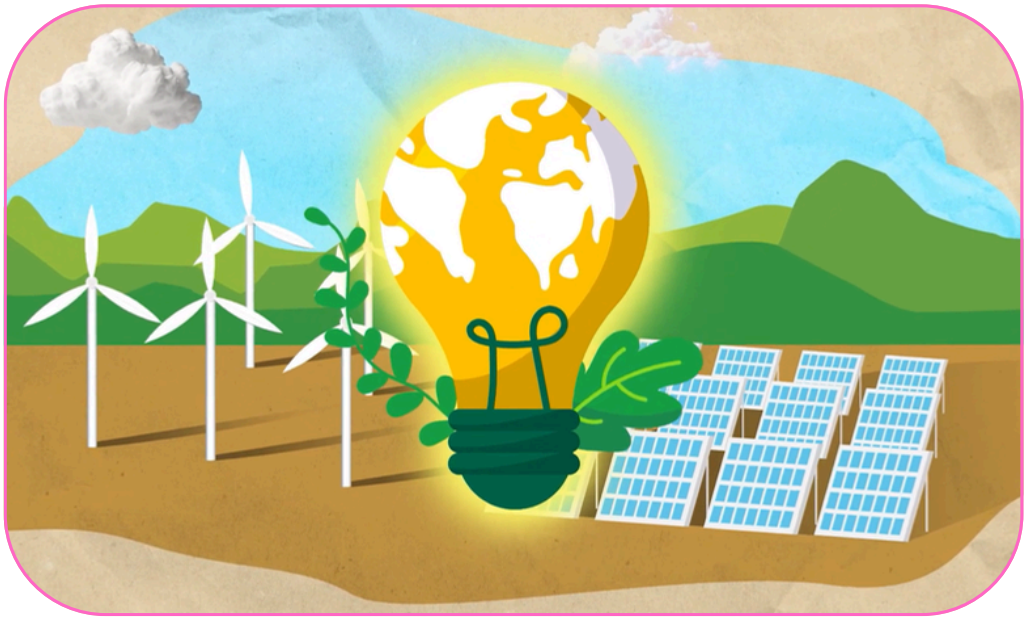
Materials and Preparation

- E-book “Tinkercad for Educators”
- E-book “Tinkercad Codeblocks”
- E-book “Building 3d Worlds in Delightex”
- Videos
- Pencil
- Ruler
- Protractor
- Eraser
- Student worksheets
- PCs or tablets
- Tinkercad account (optional)
- Delightex account (optional)
- MetaQuest 2 VR Headset (Optional)

Design CHALLENGE

Your task is to create 3D elements which, if added to your school playground, would minimize the carbon footprint of your school, make it more appealing and more resilient in climate change and natural disasters. In order to achieve it, think of how you wish your school playground was structured, how you would design it if it were your own yard.

When you create those elements you design a replica of your school (buildings and playground) in Virtual Reality. Elaborate on making it sustainable and student friendly and add the 3D elements you have previously created inside it.



Course INSTRUCTIONS

STEP 1

Watch the videos
https://www.youtube.com/@VR4Clima

STEP 2

Play the VR4Clima Game either using a VR Headset or at your PC

STEP 3

Act as a Civil or Environmental Engineer. Conduct a simple research about climate change and natural disasters in your area. Proposed links: EU Climate Adapt, European Environment Agency (EEA) Interactive maps

STEP 4

Consult the EU Climate Chart for Students to recognize the climate of your area

STEP 5

Watch the VR4Clima animations on Climate change and sustainability.

STEP 6

Brainstorm with your team on the elements that should be added in your school yard to make it more sustainable, minimize the carbon footprint of your school but are also resilient to natural disasters in your area.

STEP 7

Create 1-2 sustainable elements for your school playground. Export them in .obj or .glb format

STEP 8

Using pen and paper, sketch a design of your current playground and then another one containing the changes/additions that you propose in order to make it sustainable and climate change resilient

STEP 9

Create your proposed school playground in Delightex. Import the elements that you created in Tinkercad previously

STEP 10

Invite your peers inside your virtual world and guide them around

STEP 11

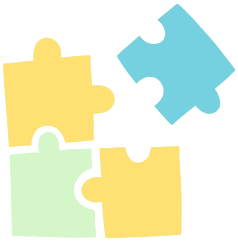
Discuss about your implementation / proposed improvements

TIME MANAGEMENT

The VR course can last as little as 1 class period without including the 3D Game. However, to help students from feeling rushed and to ensure student success, it is recommended that the course is split into 2-3 periods, allowing students more time to brainstorm, test ideas and finalize their design.

Background

CONCEPTS



Sustainable choices are determined by the climate of each area. A choice which is sustainable in a region with a specific climate can be non-sustainable in a region with a different climate. Climate is determined by the temperature, precipitation, humidity and wind speed in a region. These characteristics are influenced by topography and natural factors as latitude, proximity (water access/ distance from the sea), altitude.

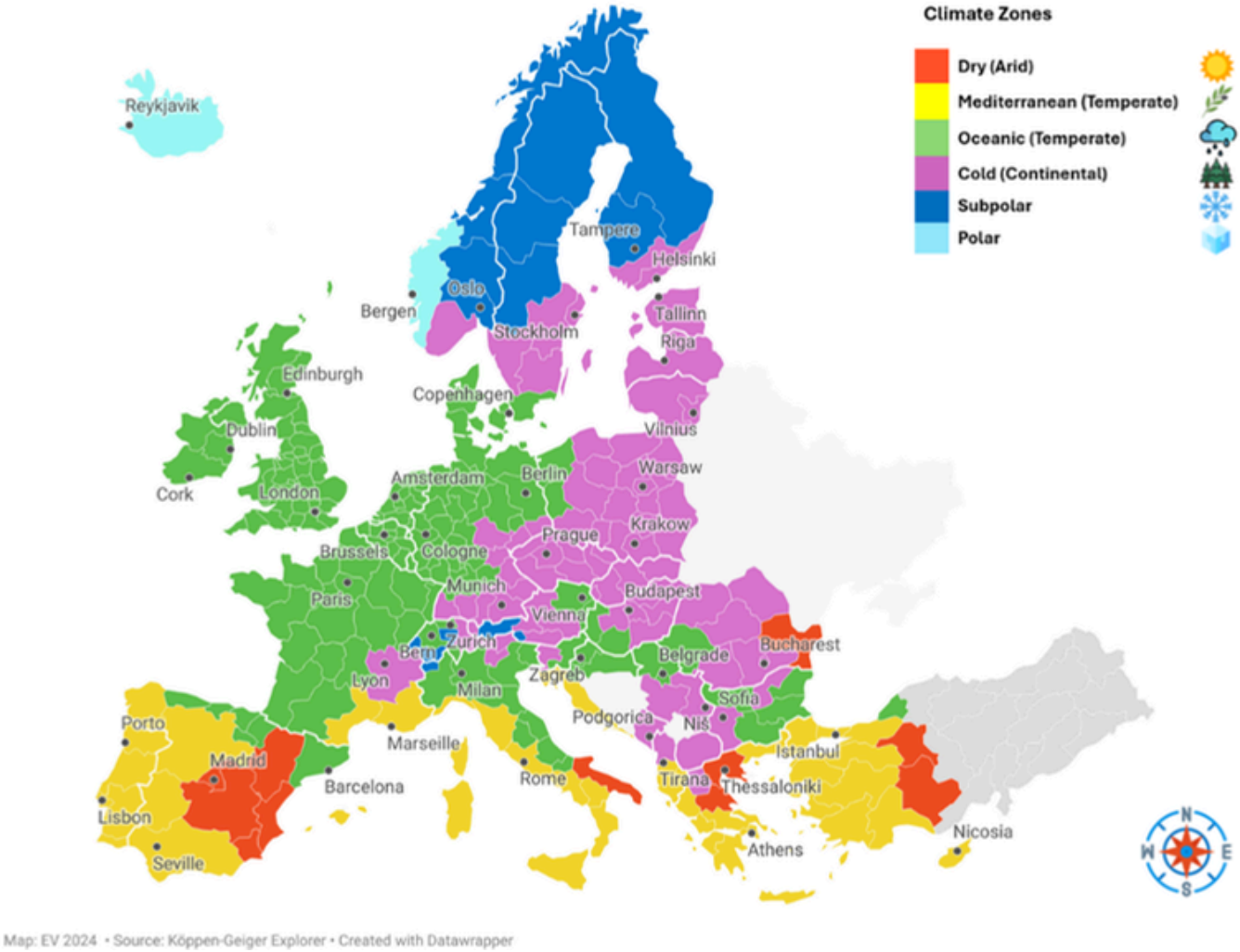
In the table below, the student-friendly climate classification is presented, detailing each climate zone alongside its corresponding color:

A/A	Class Name	Köppen-Geiger Code	Colour		Symbol	
1	Dry (Arid)	BSk, BSh	Red			Sun
2	Mediterranean (Temperate)	Csa, Csb	Yellow			Olive Branch
3	Oceanic (Temperate)	Cfa, Cfb, Cfc	Green			Rain Cloud
4	Cold (Continental)	Dfa, Dfb	Purple (Magenta)			Pine Trees
5	Subpolar	Dfc, Dfd	Blue			Snowflake
6	Polar	ET	Light Blue (Cyan)			Ice Cube

Europe’s Climate Map for Students

The Europe’s climate map for students will help students classify the climate of their region and therefore make sustainable choices depending on the climate.

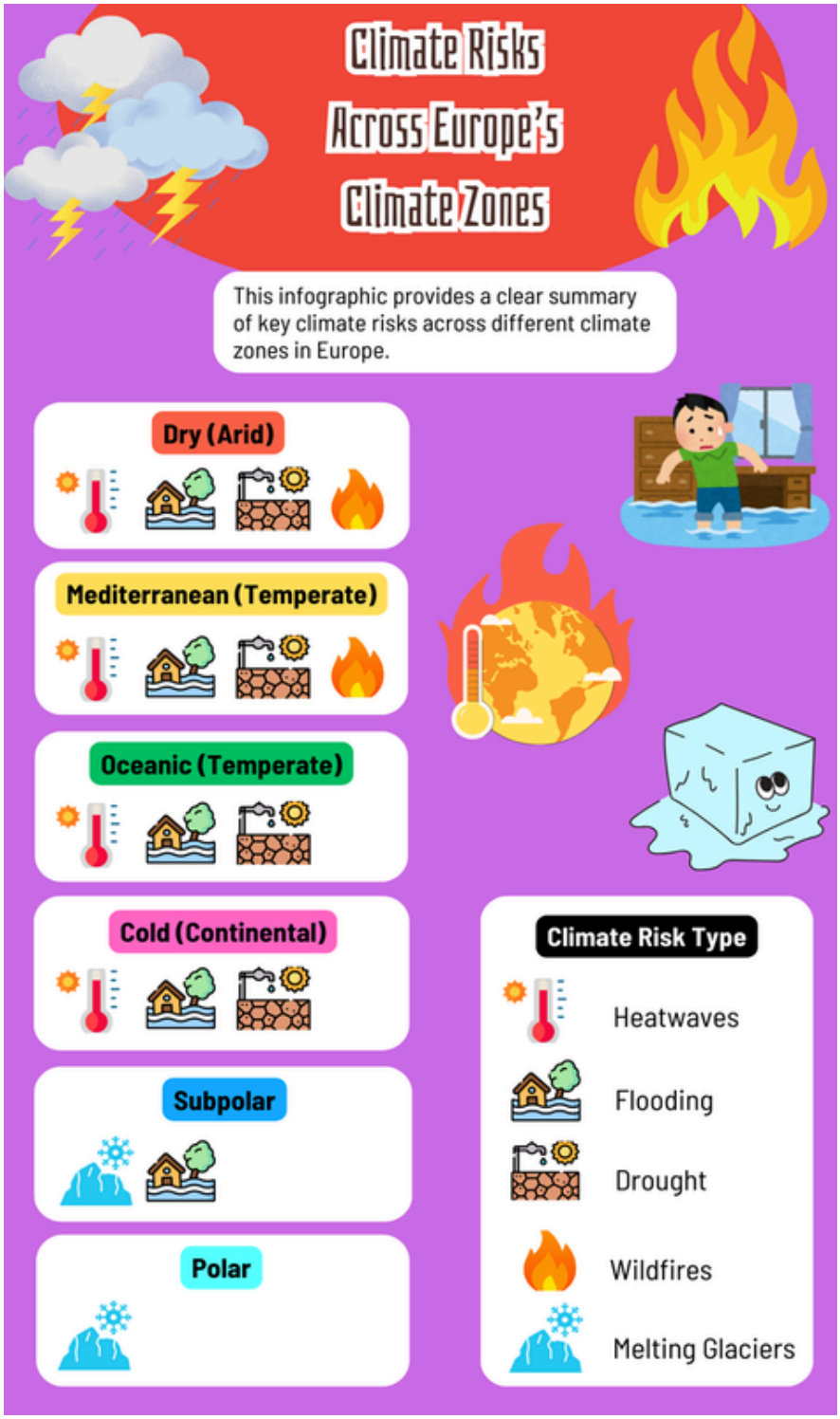
Europe's Climate Map



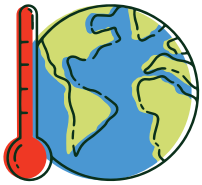
Map: EV 2024 • Source: Köppen-Geiger Explorer • Created with Datawrapper

Climate Risks

It is important that in the design phase they take into account the climate risks across Europe's Climate Zones



What is Climate Change?



Climate change means that the Earth's long-term temperature and weather patterns are changing. This isn't just about one hot summer or one big storm — it's about big, long-lasting shifts in the planet's climate. The main cause is the large amount of greenhouse gases (like carbon dioxide and methane) that humans release into the atmosphere (burning coal, oil, and gas for energy, cars, planes, factories etc.). These gases trap heat around the Earth, acting like a blanket. The thicker the blanket, the more heat gets trapped — and the planet warms. Because of climate change, we are experiencing higher temperatures (more heat waves), stronger storms and floods, more intense droughts, melting ice, rising sea levels and changes in ecosystems.

Can we do something about it?

We can reduce greenhouse gases and protect the planet by using clean energy (solar, wind), saving electricity, recycling and reducing waste, using public transport or walking, planting trees, supporting environmental policies

What are Natural Disasters?

Natural disasters are dangerous events caused by natural processes of the Earth. They happen when natural forces become so strong that they damage buildings, nature, and sometimes threaten human lives.

They are not caused by people, but human activities can sometimes make their impacts worse.

Examples of Natural Disasters: wildfires, floods, eartquakes, volcanoes, hurrucanes, cyclones, tornadoes, heatwaves, droughts, snowstorms

Should we be afraid of Natural Disasters?

It's normal to feel worried about natural disasters, because they can be dangerous and unpredictable. But the goal is not to be afraid, rather than to be informed and prepared.

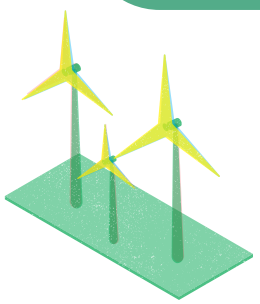
Natural disasters are part of nature. We can't stop them, but we can reduce the risk and protect ourselves. Today, scientists, governments, and communities have better technology, early-warning systems, and emergency plans than ever before. This means we often know when something dangerous is coming and how to respond.

Instead of fear, what we need is knowledge, preparedness and Community support meaning helping each other stay safe.

Sustainable choices

We can all make small changes in our daily lives to protect the environment. These changes may seem small, but when many people do them, they make a big difference.

1. **Reduce waste**: Use reusable bottles and containers, avoid single-use plastics, and recycle whenever possible.
2. **Save energy**: Turn off lights and devices when you don't need them. Choose walking, biking, or public transport when you can.
3. Buy responsibly: Try to buy fewer things but of better quality. Choose second-hand items or repair things instead of throwing them away.
4. **Avoid food waste**: Only take the food you can eat and try to buy local or seasonal products.
5. **Save water**: Take shorter showers and don't let water run when it's not necessary.
6. **Use technology wisely:** Keep your phone or computer longer before replacing it, and recycle old devices.
7. **Get involved:** Join school eco-activities, help clean up your neighborhood, or encourage friends to make sustainable choices too.



Vocabulary

Arid	very dry, with little or no rainfall
Carbon footprint	the total amount of carbon dioxide and other greenhouse gases a person, activity, or product produces
Climate	the usual weather conditions in a place over a long time
Climate resilient	able to cope with and recover from the effects of climate change
Cold	having a low temperature or lacking warmth
Continental	related to a large landmass or continent
Drought	a long period with little or no rain
Dry	having little or no water or moisture
Flooding	when too much water covers land that is usually dry
Heat waves	long periods of very hot weather
Mediterranean	related to the region around the Mediterranean Sea
Oceanic	related to the ocean or large seas
Polar	related to the North or South Pole, or very cold regions
Solar panel	a device that turns sunlight into electricity
Sub polar	the region just outside the polar areas, with cold but not extreme temperatures
Sustainability	using resources in a way that does not harm the environment and can last long-term
Temperate	having mild temperatures, not too hot or too cold
Wild fires	large, uncontrolled fires that spread quickly in forests or grasslands
Windmill	a structure that uses wind to produce energy or pump water

Alignment to CURRICULUM

There is no single, unified EU school's curriculum framework for Secondary Education; instead, secondary education is defined at the national level by each EU member state, with a focus on fundamental skills in literacy and numeracy, and personal/social development. Here we present the alignment to the Greek Schools' curriculum. The changes in other EU member states are minor

Subject Area / Course	Activity	Objectives / Alignment with the Curriculum
Geography	Study climate change and natural disasters through VR scenarios	• Understanding natural and human-induced environmental changes • Interpretation of climatic data and maps • Connection between geographic location and environmental risks
Geology – Geography	Exploration of earthquakes, floods, heatwaves, wildfires in VR	• Awareness of natural hazards in Greece and Europe • Prevention, preparedness, and mitigation strategies
Environmental Education / Education for Sustainable Development	Design of sustainable school yard solutions	• Promotion of sustainability principles (SDGs) • Responsible environmental behavior • Active participation in local environmental improvement
Physics	Climate-related phenomena (energy, heat, extreme weather)	• Understanding energy transfer, greenhouse effect, and climate systems • Application of scientific reasoning to real-world problems
Biology	Impact of climate change on ecosystems and biodiversity	• Ecosystem balance and resilience • Human impact on living organisms • Sustainable coexistence with nature
Technology	Design of sustainable elements for school yards	• Problem-solving through design thinking • Evaluation of materials, structures, and functionality • Application of sustainability criteria in technological design

Informatics/ICT	3D design in Tinkercad & virtual world creation in Delightex	• Development of digital literacy and computational thinking • Use of digital tools for modeling and simulation • Creation and manipulation of digital content
Skills Workshops – Thematic Circles	Integrated work plan: from information search to digital creation	Thematic Circles: "I take care of the environment", "I create and innovate", "Social empathy and responsibility". Development of 4K skills (Critical thinking, Collaboration, Communication, Creativity).
Informatics	Exporting 3D models and integrating them into VR environments	• Understanding file formats and digital workflows • Logical sequencing and spatial thinking • Introduction to immersive technologies (VR/3D worlds)
Mathematics	Scaling, proportions, measurements in 3D designs	• Application of geometry and measurement • Use of ratios and spatial reasoning • Mathematical modeling in real-life contexts
Civic Education / Social and Political Education	Sustainable decision-making for school environments	• Active citizenship and community responsibility • Democratic participation in collective decisions • Understanding sustainability as a social responsibility
Project-Based Learning / Skills Workshops	Collaborative project: sustainable school yard redesign	• Collaboration, communication, and teamwork • Creativity and innovation • Interdisciplinary problem-solving
European Citizenship Education	Use of European Climate Chart & EU-wide context	• Understanding European environmental policies • Strengthening European identity • Comparative analysis of climate conditions across Europe
Career Guidance / Skills Development	Exposure to green careers & digital design	• Awareness of sustainability-related professions • Development of 21st-century skills (critical thinking, digital creativity) • Career orientation toward STEM and green innovation