Co-funded by
the European Union

**A 3D Eco-land Models of our school surroundings**

# Power of Digitalisation in fighting against climate change

Italy, France, Turkey, Creece, Austria
Croatia, Poland



ZSiPO W SKALE

Project Number: 2022-1-IT02-KA220-SCH-000086101

12.2022 - 07.2025

Erasmus+

# Table of contents

# ITALY

# ECOLAND

# RESTORING NATURAL HARMONY: THE BLUEPRINT FOR THE SUSTAINABLE CITY OF THE FUTURE

## INTRODUCTION

Climate change is one of the most important and pressing issues of our century.
We, as conscious and active citizens of our time, have the duty to pay our attention on looking for solutions capable of mitigating the impact of rising temperatures on the planet.

There is no doubt that if we delay efforts to react and adapt to climate change, we would push the prospect of sustainable development far away and we would contribute to increasingly severe risks for the environment.

The phenomenon of global warming is now unequivocal.
The observed global average temperature is currently about 1°C higher than pre-industrial levels (https://www.ncei.noaa.gov/), and this is already causing significant effects: an increase in extreme weather events (heatwaves, droughts, heavy rainfall), the rise of sea levels, Arctic ice decline, an increase in wildfires, loss of biodiversity, and a decrease of agricultural productivity (200916_REPORT_CMCC_RISCHIO_Clima_in_Italia).
Our focus is particularly on the Mediterranean region, which is experiencing significant warming (exceeding the global average increase by 20%) and, in contrast to the general intensification of the hydrological cycle in temperate zones between 30° N and 46° N latitude, a reduction in precipitation (Lionello and Scarascia, 2018).
In Italy, an analysis of climate data from major national and regional observation networks reveals an increase of over 1.1°C in the annual average temperature during the period 1981–2010 compared to the 1971–2000 baseline.

Moreover, since 2010, several temperature records have been set: the hottest years since observations began were 2015, 2018, and 2019.

(www.isprambiente.gov.it/fles2020/pubblicazioni/stato-ambiente/rapporto_clima_2019-1.pdf)
The expected climate scenarios for our beautiful country include rising temperatures, fewer but more intense rainfall events, an increase in hotter and drier days, and significant changes in the marine environment (higher temperatures and water acidification).

In preparing our model, we considered above all certain aspects that characterize urban environments and we pay attention on meaningful improvements in quality of life. We realized that cities are marked by the presence of impermeable surfaces, mainly covered with concrete and asphalt, and There are limited natural areas.

Green spaces are important, especially during the summer season. In recent years, there has been an increase in the frequency and duration of heatwaves, with negative consequences for the well-being and the health of the most vulnerable groups, such as children, old people, and people with disabilities.

Urban centres are true "hot-spots" for climate change, meaning geographic areas characterized by high vulnerability and exposure. With over 56% of the Italian population living in cities, which are hubs for essential social and cultural services, these areas concentrate the impacts of climate change on a large percentage of sensitive individuals and activities.

It is well known that urban centres experience temperatures 5–10°C higher than surrounding rural areas. Additionally, there is a strong link between rising temperatures and air pollution. Urban environments are characterized by high emissions of both greenhouse gases (CO2, CH4) and other pollutants, such as SO2, NO2, CO, benzene (C6H6), fine particulate matter (PM10 and PM2.5), and tropospheric ozone (O3), which compromise air quality (IPCC, 2013).

This first analysis helped us to develop our ideas.

We start our project, Ecoland, thinking of the relationship between humans and nature. This interaction has had a deep evolution, influencing not only philosophy but also architecture and design.

Originally, humans lived in symbiosis and harmony with nature, trying to respect its cycles and laws through architecture that blended seamlessly with the environment. However, over the centuries, this connection gradually weakened, leading to a clear separation between human creations and the natural world.
A symbol of this evolution is the work of the Dutch painter Piet Mondrian. With his famous *The Red Tree*, he marked the beginning of a journey toward abstraction and simplification of form, culminating in his iconic composition, *Tableau I*, where nature is entirely fragmented into lines and primary colours.

FIGURE 1 - PIET MONDRIAN EVOLUTION FROM RED THREE TO TABLEAU I

From an architectural perspective, this process of separation is evident in the transition from natural and traditional constructions, such as trulli or medieval homes, to increasingly rational and industrialized architectural forms, like those of the Bauhaus.

Technology has also contributed to this separation, bending nature through the use of energy resources and the innovation of materials. Humans have, in fact, bent nature to their will, exploiting it in an ever more technical and functional way.

However, today we are witnessing a growing need to reverse this process, rediscovering harmony with the environment.

FIGURE 2 - MEDIEVAL RURAL HOUSE


FIGURE 3 - BAUHAUS BUILDING IN DESSAU, WALTER GROPIUS 1925

The Ecoland project fits into this context as a symbolic and practical response to this path. Unlike Mondrian, who evolved art toward total abstraction, our project aims to rediscover nature by reconnecting architecture and technology to its primordial essence.

The goal is to create an "ecological village" that draws on natural forms to create an environment that, while maintaining modern efficiency and functionality, respects the symbiosis with the natural world, working in harmony with nature, not against it.

The first human architectures responded to the need to integrate with the surrounding environment, using natural materials and taking advantage of the geological characteristics of the land. In Matera (Basilicata – Italy), for example, the homes are carved into the rock, creating a direct dialogue between construction and nature. This approach, which we could call "organic," reflected a respect for the environment and a continuous interaction with it.

FIGURE 4 - SASSI FROM MATERA

Similarly, the trulli of Alberobello (Puglia – Italy), with their characteristic conical shapes and dry stone construction, were built using local materials and designed to perfectly adapt to the climate and landscape, showing a union between nature and architecture.

FIGURE 5 - TRULLI FROM ALBEROBELLO

FIGURE 6 - TRULLI FROM ALBEROBELLO

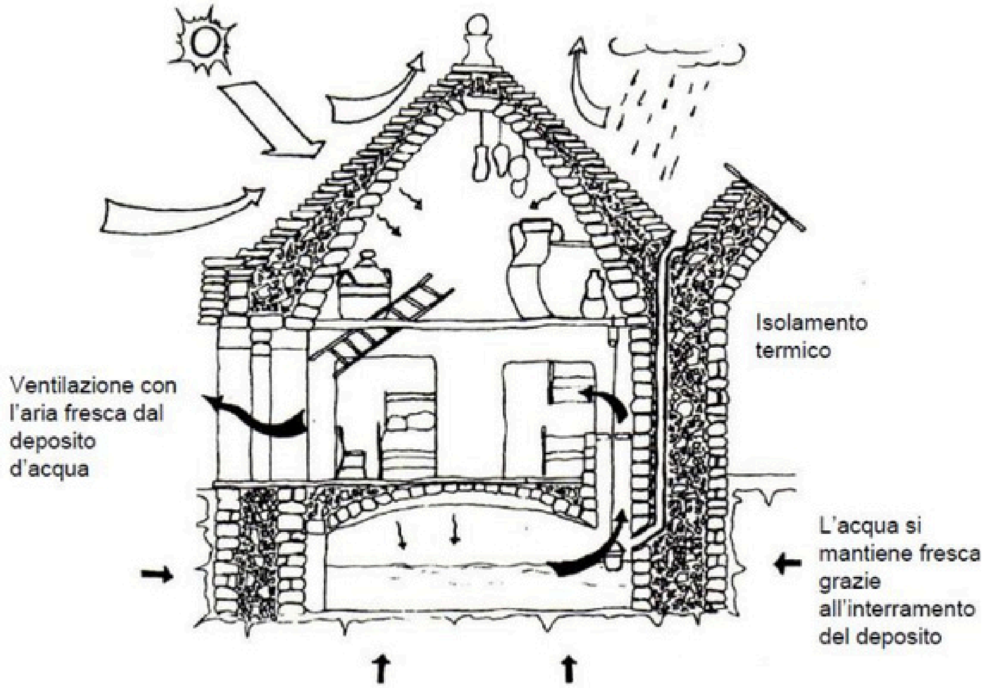



FIGURE 7 _ BIOCLIMATIC STRUCTURE OF A TRULLO FROM ALBEROBELLO

As the centuries passed, the need to respond to increasing social and functional complexity led to the separation between construction and nature. Medieval and Renaissance dwellings began to be increasingly rational, while Bauhaus movement became a spokesperson for functionality and efficiency, pushing architecture towards pure geometric abstraction.

This separation is similar to Mondrian's artistic journey, which transformed natural forms into pure abstraction. In 20th-century architecture, the use of industrial materials and the growing uniformity of spaces further underlined the separation between human construction and the natural environment.

The evolution of materials and technologies has allowed humans to "bend" nature to their interests, using natural resources in an increasingly effective way. From the stone and wood of traditional architecture, there has been a shift to industrial materials such as concrete, steel, and glass, which have made it possible to create taller and more functional structures, but increasingly distant from nature.

Similarly, the use of energy has had a radical change: from a primitive and integrated use of natural resources, as in the case of passive energy buildings, there has been a shift to the intensive use of non-renewable energy sources. However, the introduction of electricity and, later, renewable energy sources has provided new opportunities to return to a more balanced relationship with the environment.

The increasing complexity of modern functions has led to the need to occupy ever-larger spaces. Modern homes, cities, and commercial buildings are designed to meet a wide range of needs, from housing to production, entertainment to commerce. This has caused an exponential growth in land use, leading to the development of cities and the alteration of ecosystems.

## METHODOLOGY

The design of an ecoland or an environmentally respectful city aims to reduce energy impact and improve quality of life through a design that integrates innovative technologies and a harmonious relationship with nature. The homes are built to be almost energy self-sufficient, with each house using individual solutions such as custom wind turbines, integrated photovoltaics, and geothermal energy.

Additionally, the city is designed as a system of clusters, with shared spaces for work, commerce, and social interaction, aiming to reduce the need for commuting and improving mobility efficiency through the use of electric vehicles and pedestrian spaces. Reducing mobility and promoting teleworking are important solutions to reduce traffic and emissions, making the city an example of sustainability and livability.

The shape of the homes is inspired by the curves and organic geometries of nature, drawing from the sinuous lines of trees, leaves, and flowers, reinterpreting them through the use of innovative materials that respect the environment.

The materials are chosen for their sustainability and minimal environmental impact. The use of wood, natural materials, and renewable resources is important. Homes are built with eco-friendly materials that promote natural thermal insulation, reducing the need for artificial heating. The use of biomass as an energy source and the incorporation of vegetation for energy production through green photovoltaics and aquatic plants are solutions that integrate nature within the architectural design. Water, through small ponds and canals, becomes another connecting element between the homes and the surrounding landscape, optimizing both aesthetics and energy functionality.

Energy production is at the base of the project. Each home will be equipped with individual solutions such as photovoltaic panels, custom wind turbines, and geothermal systems.
The vertical-axis wind turbines have a unique design for each residential unit, making it distinctive and identifiable, much like the trulli from Alberobello, which feature personalized graphics on their roofs.

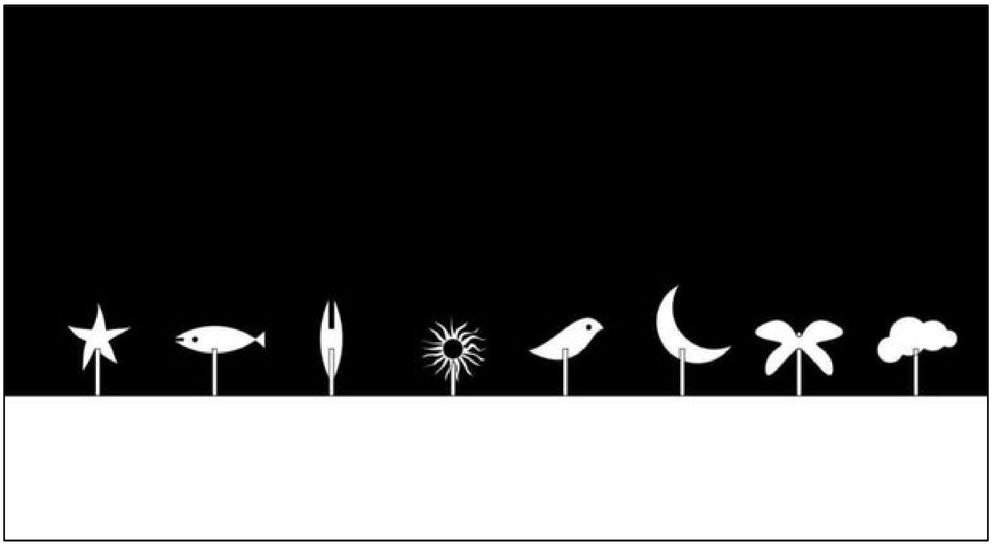


FIGURE 8 _ DESIGN OF VERTICALE-AXIS WIND TURBINES

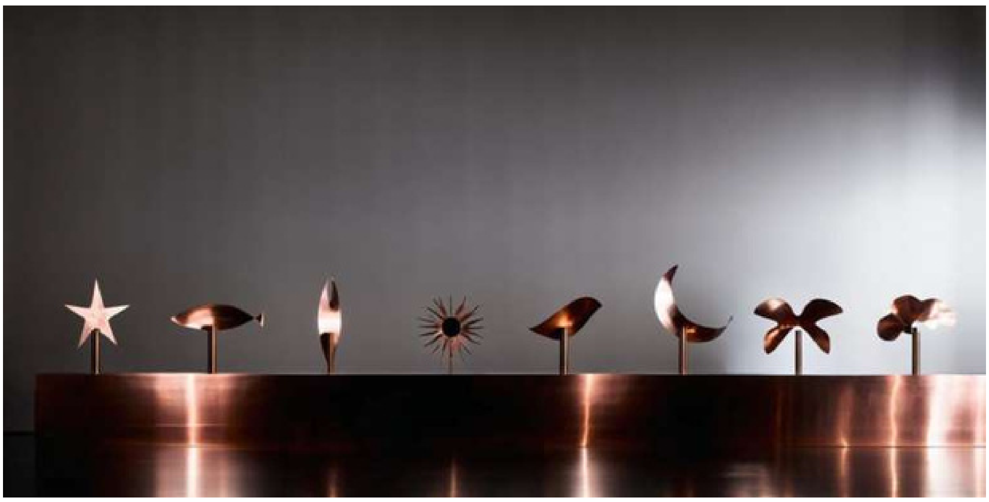


FIGURA 7 _ RENDER WIND TURBINES WITH EVOLVES VERAS

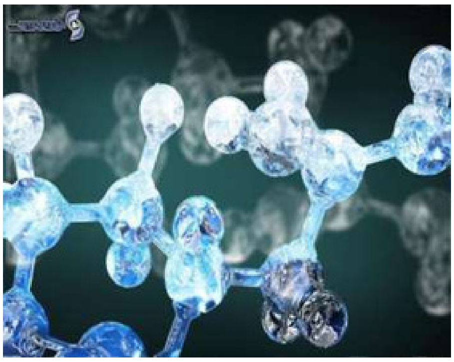
From a functional perspective, the project aims to use natural energy passively, similar to how the trulli responded to the climate and environment. The homes will be designed to maximize the use of natural light, with strategic openings to capture the sun's heat in winter and protect from heat in summer, minimizing the need for artificial heating and cooling. As with the trulli, an internal air circulation system will be proposed to regulate temperature.

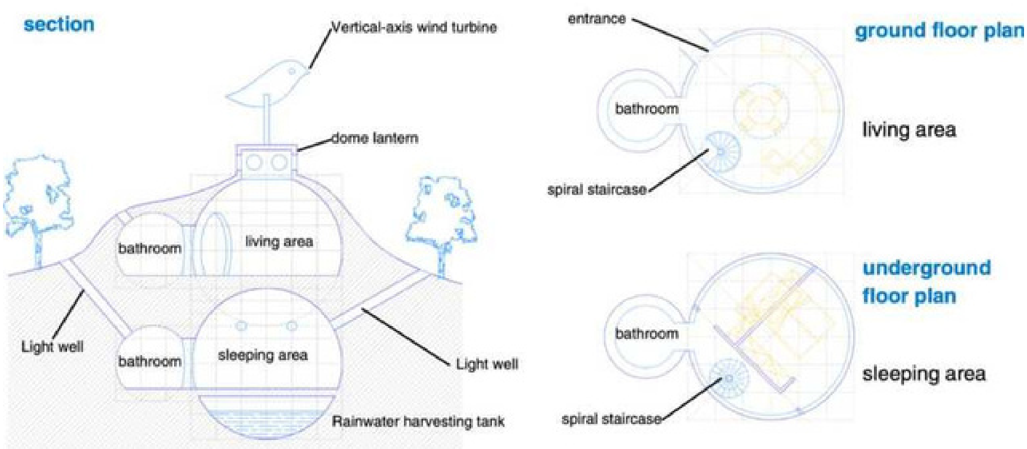
Furthermore, each home will be equipped with an underground system to collect and purify rainwater, an element that goes back to tradition but incorporates advanced technology to ensure efficiency. Electricity will be produced through biological photovoltaic systems and wind turbines, creating a self-sufficient environment.
At the city level, a centralized system is planned to integrate the energy produced by individual homes, creating an autonomous yet interconnected network. The city will be powered primarily by renewable sources, with a strong emphasis on solutions that harness solar, wind, geothermal, and plant-based energy. Plant energy is produced through the photosynthesis of moss, which is optimized by the presence of special bacteria in the soil, hydrogel, and carbon fibers. In addition to moss, bamboo is also a plant with numerous resources: it absorbs large amounts of $CO_2$, grows quickly, and produces a significant amount of biomass in a short time.

Energy management is dynamic, with the ability to store and redistribute energy, optimizing the use of available resources.
Another issue addressed is the recovery of rainwater, a valuable resource that should not be wasted. In this case, we first studied and then decided to adopt an ancient system still used in Venice, where a system of drains utilizes a layer of sand as a filter for rainwater, which is collected by taking advantage of the slope of the land.


**FIGURE 10 – DRAIN IN VENICE**

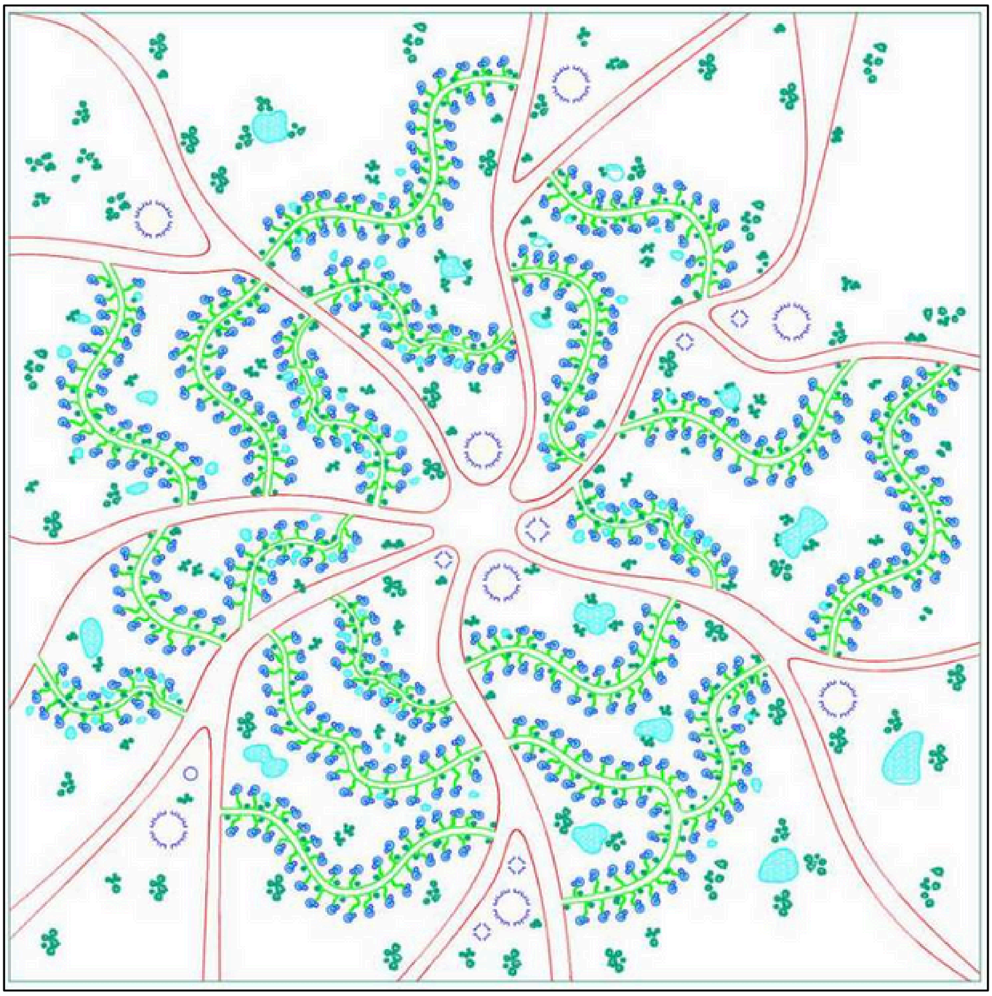
Our city integrates with nature, hiding itself and presenting itself as a "den" for humans, developing underground. For the design of each individual living unit, inspiration was drawn from the globular structure of molecules. At the centre of each unit, in the living area, there is a table, symbolizing union, socialization, and community. The skylight placed above it symbolically marks the sacredness of the family unit within the context of the community.

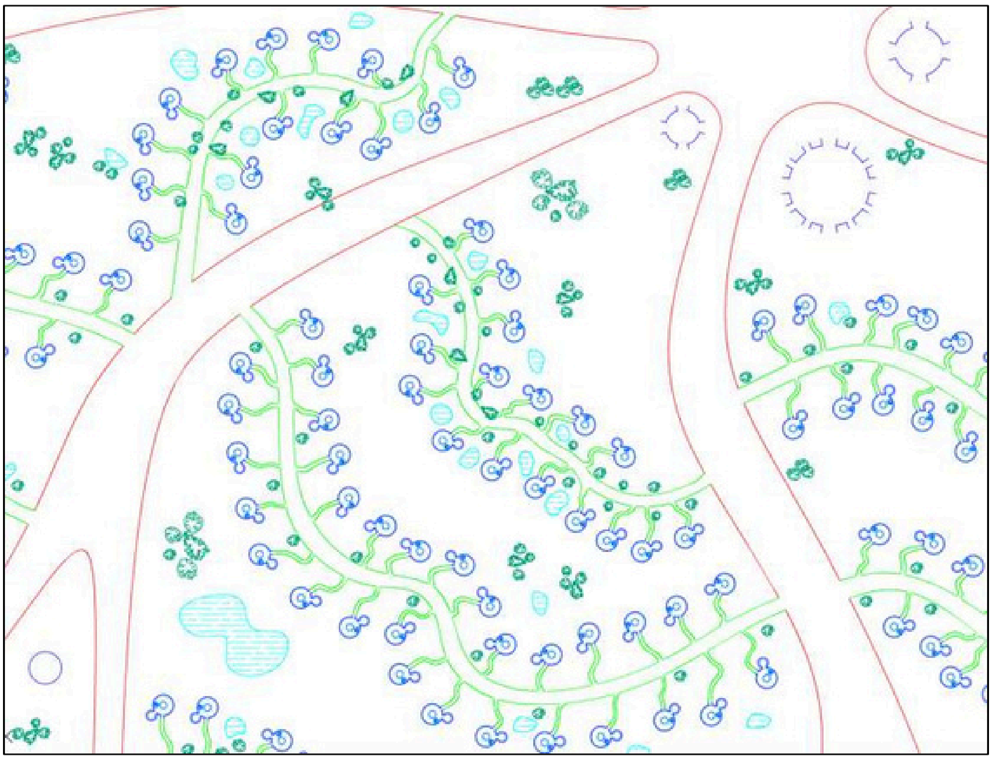




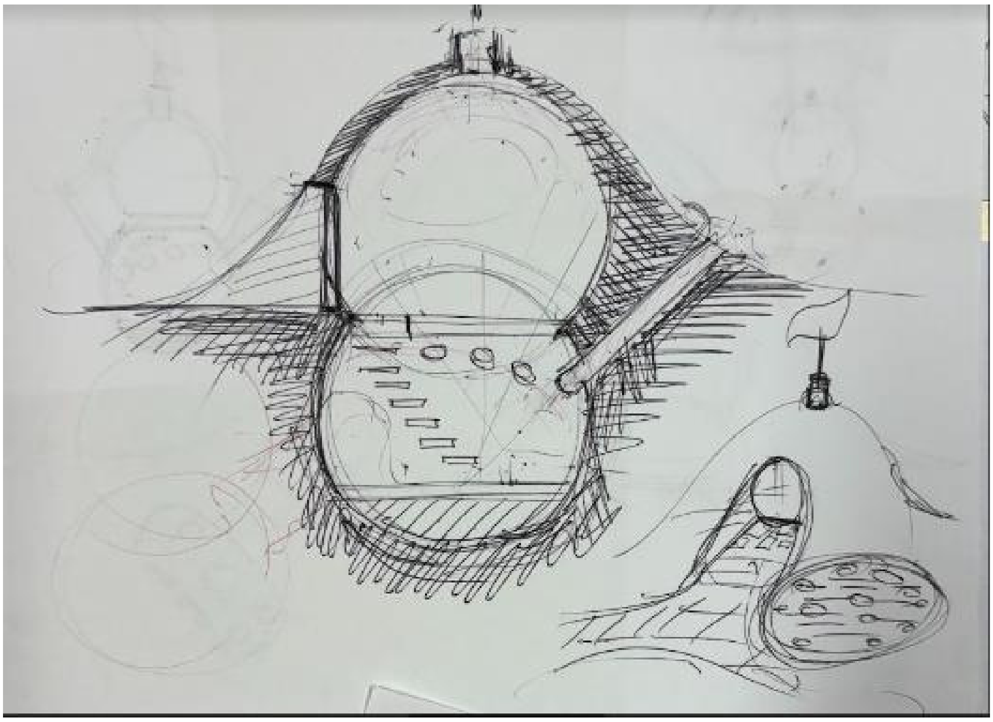

From a symbolic perspective, the Ecoland project represents a return to the roots of our relationship with nature. Each home is designed as a cell of a larger organism, interacting harmoniously with the surrounding landscape. The city of Ecoland is not just a mere cluster of buildings, but an interconnected ecosystem that respects biodiversity and promotes well-being.

For the city’s layout, inspiration was drawn from the organic radial and circumcentered structure of the pomegranate.

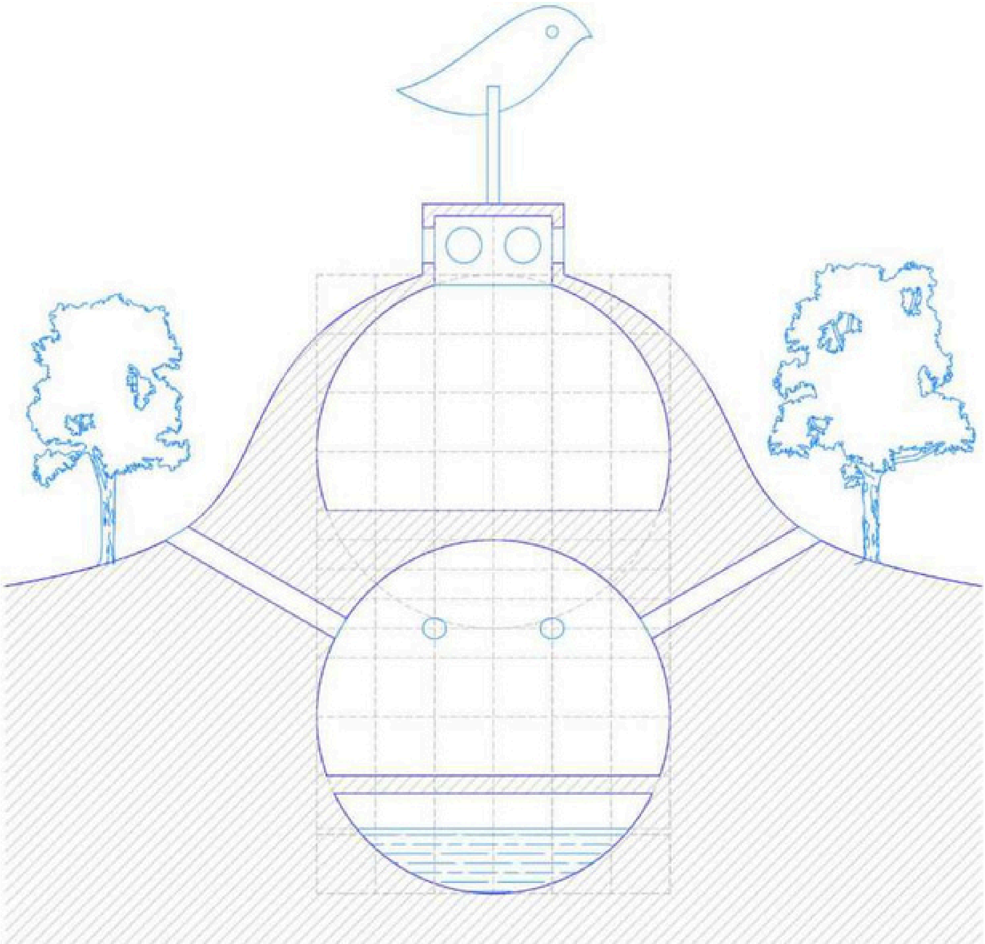


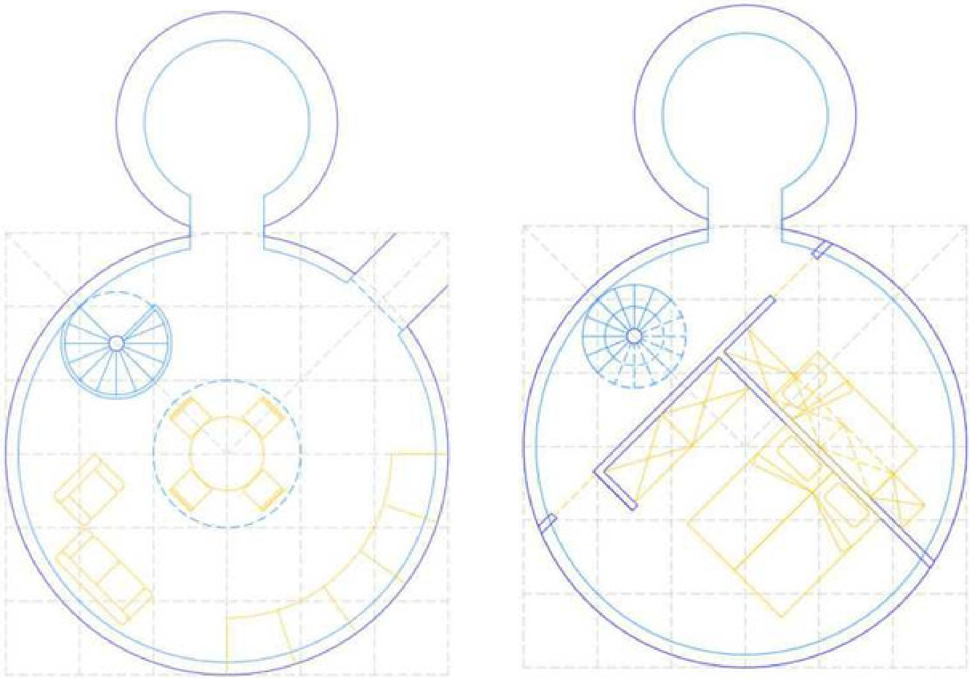


Each structure is designed to follow a natural flow, where the interaction between private and public spaces is fluid, without hierarchies, and connected by greenery. The common areas will be designed to encourage socialization and interaction among residents, always with respect for the environment.
The project has been operationally developed through various phases of active work, alternating with phases of reflection, discussion, and research.
Each creative phase began with study sketches.

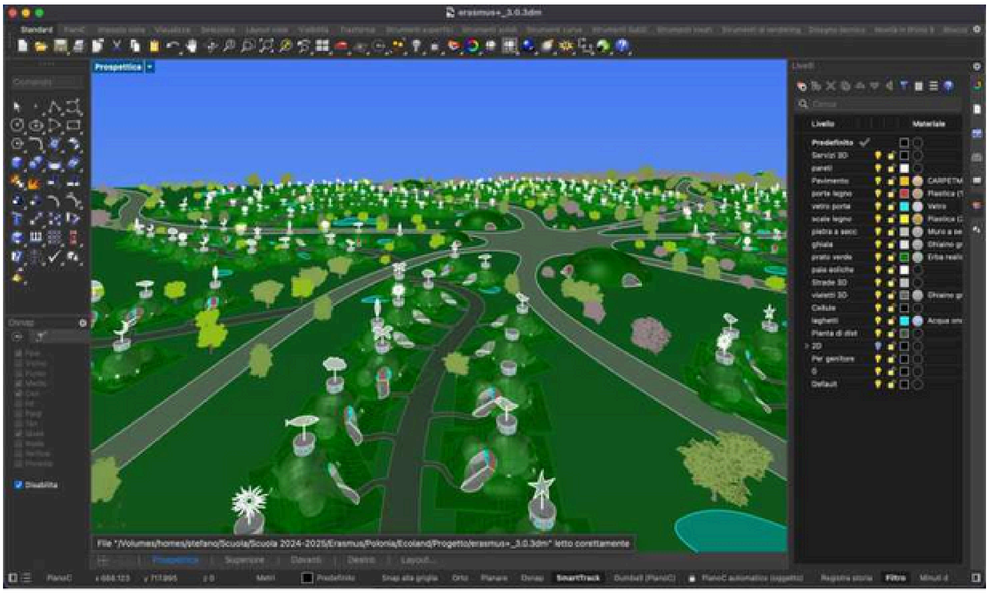


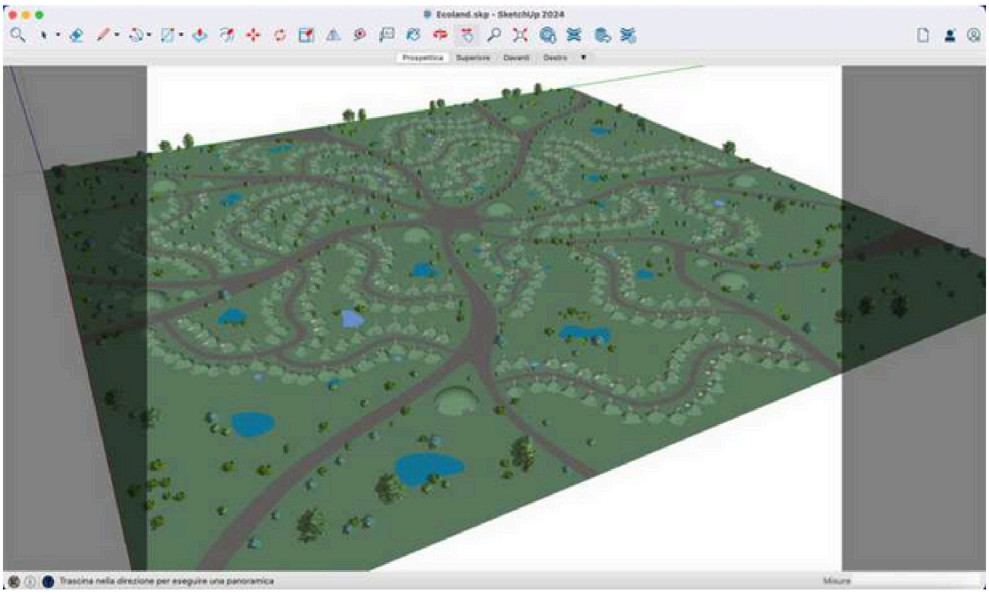
Once the feasible ideas were defined, a two-dimensional graphic definition was created using Autodesk AutoCAD.





Subsequently, once the parts of the project were defined, three-dimensional models of the individual living units and the urban ensemble were created. The 3D models were made using Rhinoceros 3D and then exported to SketchUp for sharing.





The final phase of work was the rendering of the project through the artificial intelligence platform EvolveLab Veras. In this phase, it was particularly challenging and stimulating to set up prompts capable of delivering the desired results—controlled, consistent, and predictable—due to the atypical nature of the architectural project.


## RESULTS AND DISCUSSION

The Ecoland project is part of a journey that aims to reverse the process of separation between humans and nature, a process that has characterized the history of architecture and technology. By reclaiming natural forms, materials, and functions, but reinterpreting them with modern technologies, Ecoland represents a new and sustainable vision of living, restoring the harmony with nature that humanity had lost. This project tries not only to address an architectural need but also to provoke a philosophical and symbolic reflection, aiming for a city that respects and works alongside nature, no longer forcing it but enhancing it.


IC2LODI
GIOVANNI SPEZZAFERRI


IC2LODI
GIOVANNI SPEZZAFERRI


IC2LODI
GIOVANNI SPEZZAFERRI


IC2LODI
GIOVANNI SPEZZAFERRI


IC2LODI
GIOVANNI SPEZZAFERRI


IC2LODI
GIOVANNI SPEZZAFERRI


IC2LODI
GIOVANNI SPEZZAFERRI


IC2LODI
GIOVANNI SPEZZAFERRI


IC2LODI
GIOVANNI SPEZZAFERRI

# CONCLUSIONS

The Ecoland project represents a synthesis of past and future, tradition and innovation. By rediscovering the roots of humanity's relationship with nature and integrating advanced technologies, it offers a sustainable and harmonious vision of contemporary living.

Ecoland is not just an ecological city but a living ecosystem designed to encourage a connection between individuals and the environment. Every detail, from materials to energy management, reflects a commitment to reduce environmental impact and create a place that not only respects the planet but enhances it.
This project is not merely a utopia but a demonstration that real change is possible. It is an invitation to rethink how we build, live, and interact with the world, guiding us toward a future that is more sustainable, conscious, and respectful of biodiversity.

Ecoland is not just a place: it is a message, a symbol of a new and achievable balance between humanity and nature.

# BIBLIOGRAPHY:

Adorno P. L'arte Italiana G.D'Anna 1996

Giudici L. Generazione Green DeA Scuola 2021

200916_REPORT_CMCC_RISCHIO_Clima_in_Italia

Lionello P. and Scarascia L. (2018) 'The relation between climate change in the Mediterranean region and global warming', Regional Environmental Change, 18, pp. 1481–1493.

IPCC (2013b) 'Annex III: Glossary'. In: Stocker T, Qin D, Plattner G, et al. (eds) Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change

https://www.ncei.noaa.gov/
www.isprambiente.gov.it/fles2020/pubblicazioni/stato-ambiente/rapporto_clima_2019-1.pdf
https://tuscanyplanet.com/
https://www.rinnovabili.it/featured/energia-muschio-parete-verde-biofotovoltaica -222/
https://www.futuroprossimo.it/2023/07/perchè-il bambu-e-la-prossima-frontiera-delle-rinnovabili
https://cjalzumit.wordpress.com/2018/04/07/pozzo-veneziano/
https://www.autodesk.com/it/
https://www.rhino3d.com/it/
https://www.evolvelab.io/veras
https://www.sketchupitalia.it

# TURKEY

# POWER OF DIGITALIZATION
# IN FIGHTING AGAINST CLIMATE CHANGE

## Report on 3D Eco Land Model Prepared by Turkish Team

Students Elanur AYDIN, İzem OKTAR, Elif ÇEPNİ, Elif Su CİNOĞLU

: Hüseyin ATEŞ, Ali DALGAR

Advisors:

Aims

To increasetheimportancegiventotheenvironmentbycreatinglivingspaces that are beneficial to humans andnature.Toreducetheeffectsofglobalwarmingthroughstudies carried out.

-  Tominimizeclimatechangeanditseffects.
-  Toreducetheconsumptionofharmfulresources
-  Toincreasetheuseofrenewableresourcesinsteadofnon-renewable resources
-  Todecreasetheharmtowardstheenvironment.
-  Tocreatenewjobopportunitiesbasedonrenewableresources.

Comingtoaconclusion;weareaimingtodecreasetheinfluenceofclimate change by using the powerofdigitalization.

## INTRODUCTION

In ourproject,whichwascarriedoutbasedonthebehaviorsthatdistinguish humans from other beingandthedepletionofsomeresourcesinnature,weaimedtoraiseawareness and create a benefitonthisissuebydevelopingalandmodel,makingmodelsandvirtual 3D models. Althoughcitiesconstituteonly1%oftheworld'sterrestrialandice-freeUSB storage, they have significantimpactsontheenvironment.Themostimportantoneamongthese impacts is climate change,whichalsohaseconomicandsocialconsequences.Climatechange is a major problem that definesoureraandisstatedintheUnitedNationsFrameworkConvention on Climate Change (UNFCCC)as"changesthatoccuroveralongperiodoftimeasaresultof natural changes in climateanddirectlyorindirectlyasaresultofhumanactivitiesandthatdisrupt the composition of the globalatmosphere"(UNFCCC,1992).Thefactthatthecauseofclimate change is human activities,whichwasemphasizedforthefirsttimewitha95%certaintyrate in the 5th Assessment ReportoftheIntergovernmentalPanelonClimateChange(IPCC)published in 2014, was also reiteratedinthe6thAssessmentReportWorkingGroupIReportpublished in August 2021. In this context,theclimatechangeexperiencedinourageisalsoreferredtoas“anthropogenic (human- induced)” climate change (IPCC, 2014; 2021).

Agriculture:Ithasgreatimportanceinfoodsupply,whichisoneofthebasic needs of humanity. The sectormostaffectedbyglobalwarming,whichwecanconsiderasthe biggest problem of our age, is agriculturalactivitiescarriedoutundertheinfluenceofnaturalconditions. Global warming is an eventthatincreasestherateofgreenhousegasesintheatmosphereas a result of human activities.Globalwarmingintheworldandinourcountry;Ithasmanyeffects such as changing precipitationregimeandamount,experiencingseasonaltemperatureincreases, problems in photosynthesisandfertilizationinplants,watershortage,exposureofplants to abiotic stress conditions,andtheunproductivityofagriculturallands(Tıraşcı&Erdoğan, 2021).

NaturalCauses of ClimateChange:

The flatteningoftheEarth'sorbitaroundtheSunevery95,000yearsbringstomind ice ages that lasted 100,000years.
Ithas beendeterminedthatthereisanaturalshiftintheEarth'saxiswithaperiod of 4000 years and a circular deviation with a period of 23,000 years (Milankoviç, 1930).
Some scientistsconsiderthechangeinthedirectionoftheoceancurrentsystems and winds as a result ofcontinentaldriftasoneofthecausesofclimatechange.
Periodicexcessesinvolcaniceruptions,dustrisingfromtheeruptionformalayer that prevents the passage of sunlight and the temperature drops.
The averagetemperatureoftheEarthdroppedbyabout1°Cwiththeeruptionof the Pinatuba Volcano in the Philippines in 1991.
Sunspots also affect the amount of energy the Earth receives.
Accordingtoscientists,aftervariousglacialperiodsexperiencedbytheEarth,the Earth should currentlybeinacoolingtrend,butobservationsoverthelast150yearsshowthat something is wrong.Thewarmingtrendthatlastedfromthemid-19thcenturytothe1940spaused until the late 1960sandacoolingof0.25°Coccurred.Warmingacceleratedagaininthe1970s and 1998 was the warmest year in the last 1200 years.
TheAntarcticcontinentinthesouthernhemispherehasasignificanteffectonthe world's climate. It is thecoolingunitoftheworld'sclimatesystemandaffectstheformationofwind patterns. Its relationshipwiththeoceanisalsoextremelyimportant.SincetheAntarcticcontinent is covered withicewhosethicknessvariesfromplacetoplace(1.5-4.5km),itreflectsback 80-85% of the incomingsunlight.This is whythis continentis socold(Aksayet al.,2005).

## Global Warming

Global warmingisdefinedastheincreaseintheaverageworldtemperatureinthe parts of the atmosphere closetotheearth'ssurface,eithernaturallyorduetohumaninfluence. The temperature on the Earth'ssurfaceisdeterminedbyfourmainfactors:

- The amountofsunlighttheEarthreceives
- The amountofsunlighttheEarthreflects
- The retentionofheatbytheatmosphere
- The evaporationandcondensationofwatervapor

### Sources Indicating Global Warming

- Geologicalrecords
- Decrease inthevolumeofglaciers
- Rising seas
- Increase inwatertemperatureinlakes
- Current measurements
- Mathematicalmodels
- Aerosols


Şekil 1: Sürdürülebilir Kalkınma Amaçları (UNDP, 2022a)

It is also addressed withimportancewithinthescopeoftheUN2030Agendaand Sustainable Development Goals (SDGs)(Figure1)andthisissuehasbecomeoneofthemain determinants in achieving the SDGs (Gu,2019:1).

Şekil 2: SKA11'in diğer SKA'larla ilişkisi (UN Habitat, 2018: 10)

ThisrelationshipwasalsoshownintheSDG11 Synthesis ReportpreparedbytheUnitedNationsHuman Settlements Program(UNHabitat)in2018andexpressed as in Figure 2 (UNDP, 2022b; UN Habitat, 2018).

## Where is Turkey in the disaster?

Turkey experiencedoneofitshottestsummersin2003,togetherwithEurope,andthiswillcontinue and increase in thecomingyears.Suddenweatherchangesandextremetemperatureswill increasingly becomeapartofourdailylives.Accordingtoprojectionsmadewiththe Intergovernmental Panel on Climate Change (IPCC) Global Climate Models,

*A large part ofTurkeywillbeundertheinfluenceofaverydryandhotclimatein2030.

*Temperatures in Turkey will increase by 2 degrees in winter and 2 to 3 degrees in summer.

*While precipitation will increase by 10 percent in winter, it will decrease by 5 to 15 percent in summer. *In addition, it is estimated that soil moisture will decrease by 15 to 25 percent in summer. *TheMediterraneanbasinwillseeariseof18 cm-12cminwaterlevelby2030,38cm -14cmby 2050 and 65 -35cmby2100."Flashfloods", astheyarecalled,havebeenacceptedasquite frequent events on the Mediterranean coastline.

In light of the changes that are expected to occur on a regional scale, it is possible to list the possible effects of global climate change on our country as follows, by benefiting from IPCC reports:

• In average climate conditions, despite a small increase in precipitation in winter, evaporation will increase in these months, along with a large decrease in summer precipitation.
•Theseasonaldistributionandintensityofprecipitationwill change.
• Instead of theaveragesnow limit,whichis currentlyaccepted as1500min projectstudies,amore realistic figure will be tried to be determined. In this context, the snow cover, which has already been below average since 1987, will decrease even more.
• Notonlywilltheamountof flows decrease,butalsotheirpeaktimeswill change.
•As thefrequencyandseverityof droughts increase,thelosses causedbyfloods will begreater.
• Water stress, which occurs due to the inability of existing water resources to meet the required amount of water, will increase both nationally and regionally.
• Ourcountryis acandidatetobeacountrywhere waterstress will beexperiencedintenselyin the nearfuture.
• Sincetherewill be"uncertainties"inwatersupplysystems, thecostofinvestmentprojects will increase.
•Theimportanceof reservoirs willgraduallyincreaseduetotheuncertaintythatmayarise dueto climate change. However, it is expected as an inevitable result that planning under conditions of uncertaintywill beincreasinglyneededintheplanningofstoragefacilities.Ontheotherhand,this needwill result inthedevelopmentofrelationships andinteractions betweenthoseworkinginthe fields of research, management and policy.
• Theuseofsyntheticallygenerateddata,whichisnotyetsufficientlyusedinourcountry,will become widespread.
• In ordertoreducethedemandforwater,realisticpricingofwaterwillbeneededmorethanever (Aksayetal.,2005).

## The Importance of the Research and Our Difference

Although there are many projects that have been addedtotheliteratureandsupportthesubject, there is no project that transforms a land model into somethingwecanseeandtouchwithoureyes and supports that model with a 3D virtual model. In thisrespect,ourprojectisoriginal.

Problem: Gases such as $CO_2$, $CH_4$, $N_2O$, CFC, $O_3$, andCOintheatmospheresurroundingthe Earth create a greenhouse effect and ensure that the Earthremainsatitscurrenttemperature.The gradual increase in greenhouse gases in the troposphere,whichisanaverageof11kmabovethe

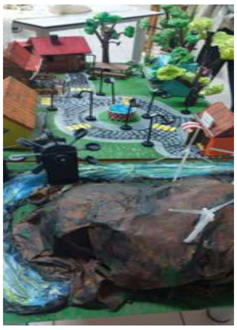
Earth's surface, causes a chain of events that threaten the lives of all living things, which we call global warming. Human activities, especially excessive use of fossil fuels, rapid population growth, and increasing living standards, are events that increase the effects of global warming. Natural disasters observed as a result of global warming make life difficult for plants and animals, especially human life. It is estimated that these sudden, extreme, and drastic changes in the Earth's climate system will leave no land for agriculture or a place to live in 30-40 years from now (Akın, 2006). We have prepared a land model in line with these problems.

## Research Questions

1. What is climate change?
2. What are the negative effects of living spaces in different areas?
3. How does not living in environmentally sensitive places affect people?
4. How does the use of non-renewable resources affect human health?

## Data Collection Tools

- Literature review
- Consulting our school teachers on necessary issues
- Using materials such as videos, photos, etc. that will help us use the SketchUp 3D Program Field


## Field Work and Studies Conducted on Our Model Work and Its Details

First, we designed a sustainable village model. In this model, we designed 2 types of houses, 1 market, 1 bakery and 1 school. Technologies that aim to make all designed structures sustainable were used.



Pipes that collect and collect waste rainwater were used for the market, which aim to store and reuse rainwater. These pipes were placed on the slope of the building's roof, facilitating the collection of wastewater.
This collected water was then transferred to the water tank next to the building, aiming to reuse the water.

As for the first of our houses, we designed an ecological tree house. We positioned this tree house next to the nature-friendly park we built. Thus, we aimed for the living creatures in the area to stay safely and for this building to be environmentally friendly and useful. In addition to the bird nests in the natural park we built, a bird nest was also placed on this building, creating a suitable living environment for birds.

In the remaining 2 house designs, the aim was to recycle water by using waste rainwater gutters in our school and in the market. Solar panels were placed on all buildings to meet some of the energy needs of the houses in this way. We provided fertile agricultural areas by placing large gardens in front of our houses. In this way, the homeowners obtained products that were sufficient for themselves by doing agriculture without pesticides and also ensured their health.

Apart from the structural elements, the pavements were used to convert the energy released by footsteps first into kinetic energy and then into electrical energy, a renewable electricity generation method also seen in Japan. Solar panels were placed on the street lamps, aiming for the street lamps to provide their own electricity, thus saving electricity. An ornamental placed in the middle of these structures to provide an aesthetic appearance.


If we move away from the city, the mountain model that comes before us is equipped with windmills, aiming to provide the electricity needed for the city from wind energy. The areas next to themountainarereservedfor dryfarming.Bygrowinglavenderin theseareas,it is aimedto generateincomewiththis method,toensurecontinuityinagriculture,andtocontribute tothe developmentof thevillageinthefieldof tourism.Thereis ariverpassinginfrontofthemountain. With a system built on this river, electricity is generated by using the kinetic energy of the water carried by the river. In this way, every element placed in the village is supported by sustainable technologiesandalltheelectricalenergythecityneeds is metfrom sustainableenergysources such as windenergy,solarenergy,hydroelectricity.Finally,therearesolarpanelsonthestreetlightsso that theycanprovidetheirownelectricity.

As for the model making, our model was first made in a physical form and then transferred to a digital environment to make it easier for people to visualize the designed land model. Cardboard and styrofoam foam were used in the making of our model. In addition, waste materials such as water bottles, water bottle caps, straws, plastic storage containers, soda caps, plastic teaspoons, and garbage bags were also used. For example, waste materials were used in the construction of the mountain to give it volume and height. Garbage bags were used to give the appearance of water, and soda caps were used in the construction of the street lamps.

## SketchUp Model

## Benefits of Our Model

With the constructionofthisland model, although it is small at first, later on, large-scale awareness can be created and researchand studies can be conducted, and thus a beautiful change can be made worldwide.
If this study is put intopractice, a generation can aim to save other living and non-living beings besides their own livesandincrease such areas. This project can even be implemented in big cities and support more peopletohear and produce their own electricity.
The implementation ofthisproject will also provide a small benefit to the economy of the states and will also provide incometothe treasury as it will reduce costs.
The number of employerswill also increase as it will provide new job opportunities

Most importantly, this project will provide a great benefit to nature.
It can also ensure that the effects of climate change are felt less.

## Suggestions

More extensive research can be done on this subject.
Efforts can be made to reduce the impact of effective resources on the world.
Efforts can be made to increase the impact of renewable resources.
There could be more suggestions about this subject, that affects the world and everything that on the planet.

## REFERENCES

Aksay, C. S., Ketenoğlu, O., & Kurt, L. (2005). Küresel ısınma ve iklim değişikliği. Selçuk Üniversitesi Fen Fakültesi Fen Dergisi, 1(25), 29-42.
Tıraşcı, S., & Erdoğan, Ü. (2021). The impact of global warming on agriculture. Journal of Agriculture, Food, Environment and Animal Sciences, 2(1), 16-33.
Şanlı, B., & Özekicioğlu, H. (2007). Küresel ısınmayı önlemeye yönelik çabalar ve Türkiye. Karamanoğlu Mehmetbey Üniversitesi Sosyal Ve Ekonomik Araştırmalar Dergisi, 2007(2), 456-482.
Çetinkaya, Z., & Ciravoğlu, A. (2016). Sürdürülebilir yerleşim modellerinin karşılaştırılması: Eko-kent ve yavaş kent. İdealkent, 7(18), 246-267.
Tuğaç, Ç. (2022). İklim değişikliği krizi ve şehirler. Çevre, Şehir ve İklim Dergisi, 1(1), 38-60.

Erasmus+

# AUSTRIA

# ERASMUS+ REPORT TEAM AUSTRIA

A 3D Eco-land model of our school surroundings

Theodor Billek, Noah Hitzinger, Johanna Hochsteger, Natalie Syrovatka, Thomas Lion, Christina Schreink

## Contents



### 1. Project Overview

Inthis phase of our project, we were tasked with redesigning a public space to make it more climate-friendly and appealing. Given our firsthand experience and the challenges faced at our school (Gymnasium Draschestraße), we decided to focus our efforts on transforming its surroundings. Our objectives were driven by several pressing issues: the excessive noise from the busy street disrupting learning; the lack of sufficient safety and green spaces in front of our school for younger students; and the negative environmental impact resulting from the absence of solar panels on the school campus, increasing reliance on external energy sources.

### 2. Effects of noisy learning environments on students

Ithas long been known that loud educational settings have negative effects on students' learning. Buchari and Matondong (Buchari & Matondang, 2017) found that noise levels around 72 dBA (which were placed in a so-called "Red Zone") lead to detrimental effects on students health, including dizziness and unpleasant emotions, as well as on their education: a 22% decline in their learning performance. In an earlier paper (Ali, 2013), it was demonstrated that a significant number (57%) of students between the ages of 13 to 15 stated that they were distracted from class by noise levels in the range 61 – 73 dB. Students further claimed that they were "highly annoyed" by the permanent disruption and cited road traffic as one of the most annoying sources of disturbance. Finally, a large study of 1358 children (Hygge, 2003) demonstrated that road traffic noise impairs students' ability to recall information.

## 3. Impact of green spaces surrounding schools

Theplacementof urban vegetation in the surroundings of learning environments brings a plethora of benefits. In a review article (Gert-Jan Vanaken, 2018) it was found that, according to more than 20 studies, an environment with plenty of greenery reduces the students' "hyperactivity and inattention problems" and is beneficial to their mental health.

The work of McCormick (McCormick, 2017) investigated children's mental well-being and school functioning, finding a positive relationship between access to green space and the improved mental well-being and cognitive development of children.

Furthermore, researchers at the university of natural resources and life sciences in Vienna found (in their research program: "city of the future") that the shade provided by trees has a cooling effect and can save energy (Stangl, 2019). This work is further supported in an article by Bruse (Bruse, 2003). Significant cooling effects were demonstrated in a street surrounded by buildings on either side with the inclusion of urban vegetation (see Figure 1 below).

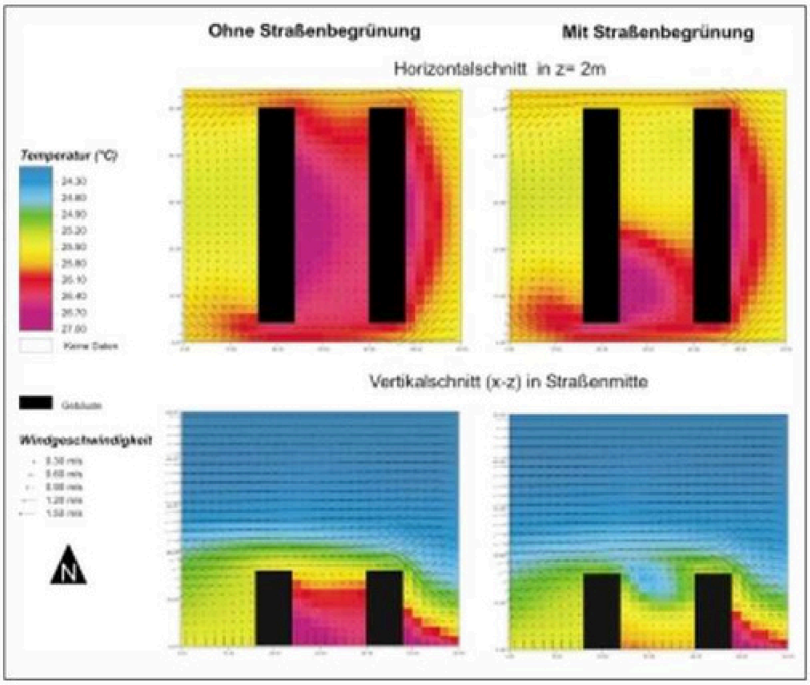



Figure 1: Simulatedair temperature and winds for a greened (right) and non-greened (left) street. Figure taken from (Bruse, 2003).

Given the compelling evidence presented, it becomes evident that implementing green spacesaround schools would yield numerous benefits. Not only do such spaces support the mental well-being and cognitive development of students, as highlighted byMcCormick and others, but they also contribute to mitigating urban heat effects and enhancing the local microclimate, as demonstrated by research conducted in Vienna and supported by ENVI-met simulations. Green spaces offer both immediate and long-term advantages, including improved concentration, reduced hyperactivity, and the creation of a more comfortable and sustainable learning environment.

By introducing green space, whether through the planting of trees, the addition of shrubbery, or the establishment of small parks, our school could actively contribute to the overall well-being of students, provide an energy-efficient cooling solution, and promote ecological balance. These changes would reflect a forward-thinking, environmentally-conscious approach to education, underscoring the importance of integrating nature into urban spaces for the benefit of future generations.

## 4. Approach andPlanning

To address these challenges we developed a comprehensive model which demonstrates a plan to redesign the school’s surroundings. Through collaboration with an architect, using a preliminary model of the area to guide our redesign, we conducted a detailed noise pollution study to quantify the problem. Additionally, we assessed the feasibility of installing solar panels on our roof by utilizing advanced tools and analyzing data from our school’s energy bills.

## 5. SolarPowerInitiative

Using the EU-developed app PVsites, we explored various configurations to determine the optimal area and positioning for solar panels (see Figure 2 for a snapshot from the simulation software, demonstrating solar irradiance levels for the school). Our analysis revealed that 46 square meters of panels would be ideal (see Figure 3 for typical daily solar power generation from such a setup for the months of June and November), generating an average monthly output of 6,563kWh, even when accounting for power generation losses. This setup would cover approximately 36% of the school’s total energy usage for a given month. While we initially aimed for 100% coverage, we concluded that achieving this goal was not economically feasible. By experimenting with different configurations, we ensured our proposed solar power system would deliver maximum efficiency and a strong return on investment.

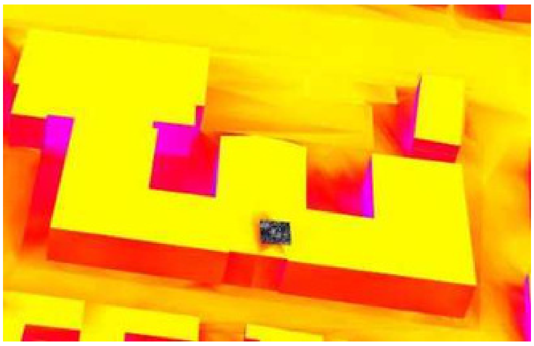


Figure 2: Snapshot from the software package PVSites for the solar irradiance incident on our school, Draschestraße

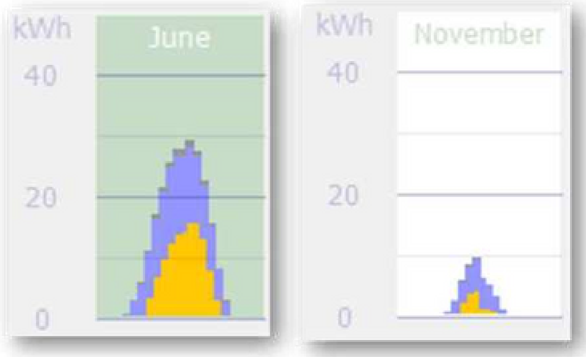



Figure 3: Typical daily solar power generated from 46 square meters of solar panels placed on the roof of the school for the months of June and November.

## 6. NoisePollutionStudy

We also examined the impact of noise pollution on learning, focusing on physics classrooms facing the street, a location often cited in teacher complaints. Using tools such as the "YouLearn Online Loudness Meter" and the "Voltcraft Multifunktions-Umweltmessgerät", we recorded data over an eight-hour period spanning multiple afternoons. The study revealed that noise levels peaked at 67.7 decibels, comparable to the noise created by moderate traffic, with quieter periods averaging around 53 decibels (see Figure 4). Given that the higher end of the results are similar to those in the aforementioned studies, we can conclude that noise pollution in our school likely leads to a significant loss of students' ability to concentrate, creating an unsuitable learning environment for both students and teachers alike.

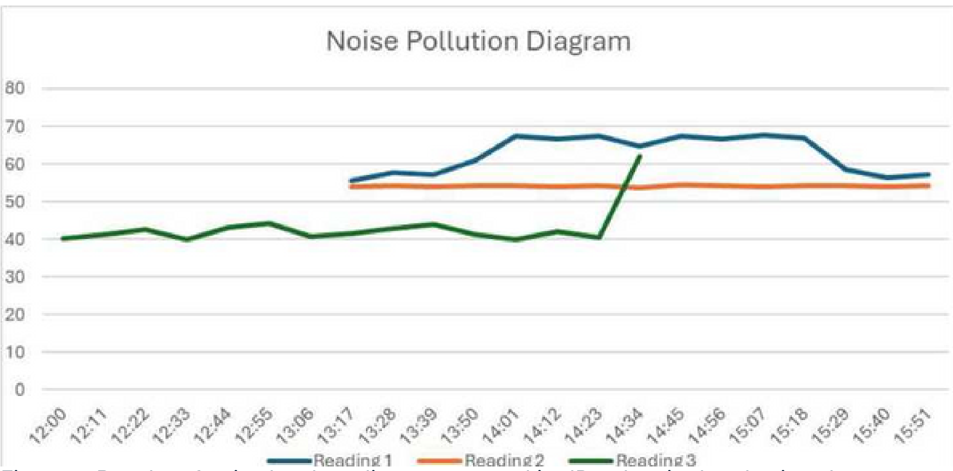



Figure 4: Results of noise level readings, measured in dB, taken in the physics classrooms of our school. The classrooms are situated looking out onto the street. Readings were taken on different days, both with the windows closed and open.

## 7. Traffic Rerouting Plan

Tomitigate thenoise issue, we proposed rerouting traffic from Draschestraße, a two-lane, one-way street, to Kolbegasse, a parallel street. This change would transform Kolbegasse from a one-way street into a two-way street with a single lane in each direction (a rough outline of the plan is shown in Figure 5). Kolbegasse already features noise-insulating walls installed by residents, thus being better equipped to handle increased traffic. This rerouting would significantly reduce noise levels around the school and improve the learning environment.


Figure 5: The current traffic plan is shown in the left picture and our proposed changes are illustrated on the right. Images were produced with the aid of Google Maps.

## 8. Transformations in front of the school

Inour SketchUp model, that also showcases our traffic concept, we remodelled the area in front of our school to include benches, greenery and exercise equipment. This ensures the students have a nicer environment to spend break times, as well as the time before and after school. Furthermore, the green vegetation would provide shade, improving the microclimate by cooling the air and would have a positive psychological impact on students as proven by the previously mentioned studies.

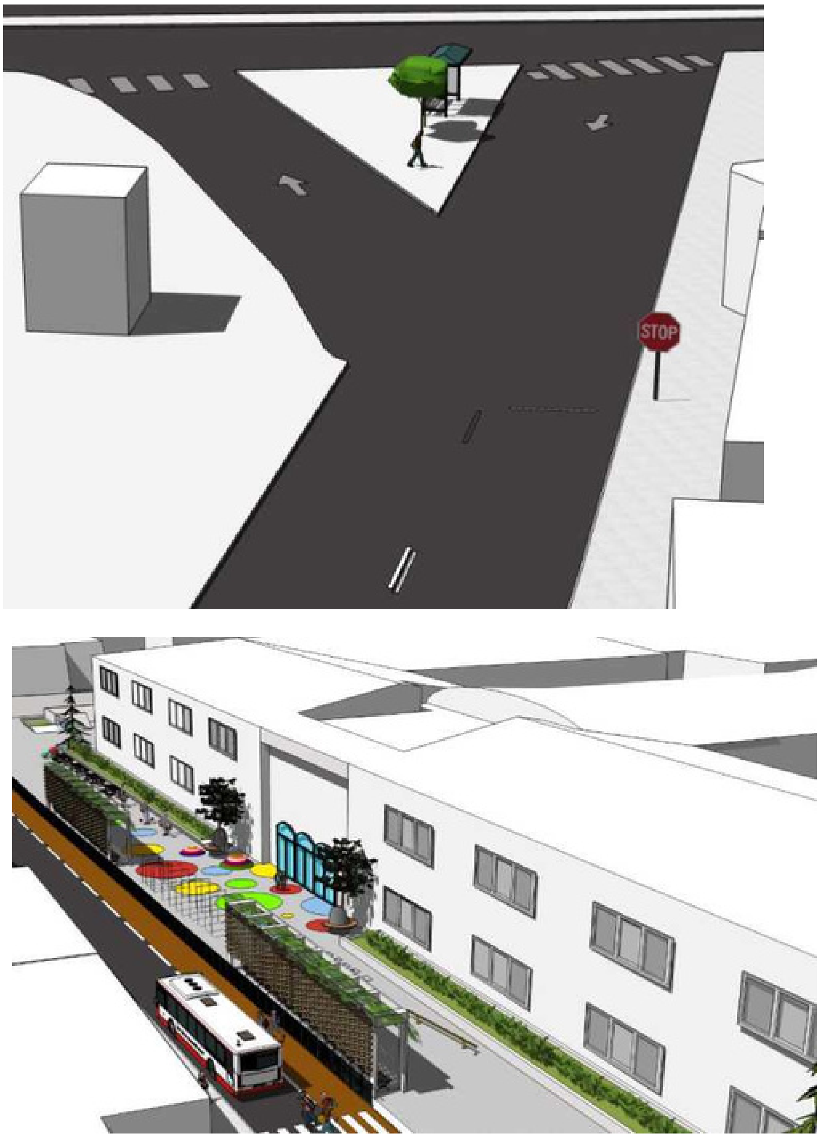



Figure 6: Snapshots from our 3D model produced in SketchUp. In the top panel a snapshot from the Kolbegasse is shown with the newly proposed two-way-traffic system along this road. In the bottom picture, the area in front of our school has been re-imagined, having eliminated one lane of traffic.

## 9. Next Steps

Weplan to present our proposal to the local district council president with the hope of securing approval and funding. Upon receiving approval, the district council will undertake the implementation of the traffic adjustments, while we will proceed with the installation of the solar panels on the school premises. Subsequently, we will carefully monitor the outcomes to ensure the successful achievement of our objectives: mitigating noise pollution and enhancing sustainability.

## 10. Conclusion

Thisproject represents a comprehensive and forward-thinking approach to transforming our school’s environment, enhancing both its liveability and sustainability. By addressing the pressing challenges of noise pollution, lack of green spaces, and energy consumption, we have developed a strategy that not only improves the quality of life for students but also contributes to a more sustainable future. The proposed green spaces will create a healthier and more productive learning environment, while the installation of solar panels will reduce the school's environmental footprint and reliance on external energy sources. By combining these elements with traffic rerouting and the addition of recreational spaces, we aim to create a school that serves as a model for eco-friendly and student-centric design. We hope this initiative will inspire similar projects in other schools and communities, contributing to a greener, healthier, and more sustainable future for all.

# Bibliography

Ali,S. A. (2013). Study effects of school noise on learning achievement and annoyance in Assiut city, Egypt. Applied Acoustics, 602-606.

Bruse, M. (2003). From ENVI Met: https://envi-met.net/documents/papers/66_70_Bruse_pdf.pdf

Buchari, & Matondang, N. (2017). The Impact of Noise Level on Students' Learning Performance at State Elementary School in Medan. (pp. 040002-1 - 040002-9). AIP Conf. Proc.

Gert-Jan Vanaken, M. D. (2018). Impact of Green Space Exposure on Children's and Adolescents' Mental Health: A Systematic Review. Int. J. Environ. Res. Public Health.

Hygge, S. (2003). Classroom experiments on the effects of different noise sources and sound levels on long-term recall and recognition in children. Applied Cognitive Psychology, 895-914.

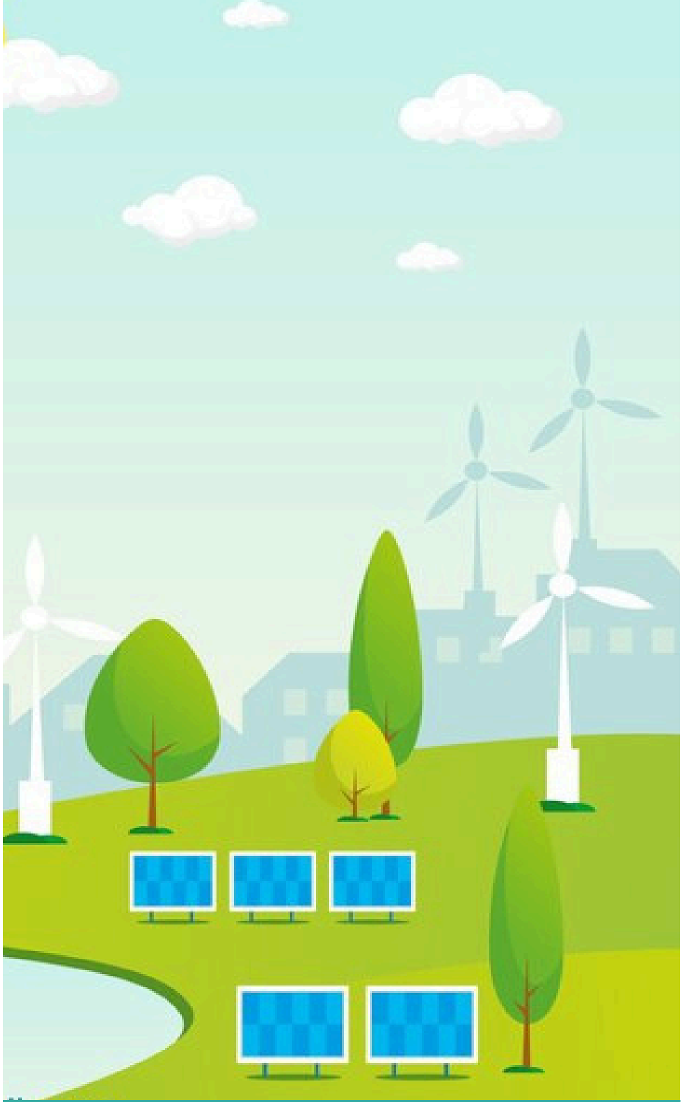
McCormick, R. (2017). Does Access to Green Space Impact the Mental Well-being of Children: A Systematic Review. J. Pedriatr. Nurs., 3-7.

Stangl, R. (2019). From Klima Wandel Anpassung: www.klimawandelanpassung.at/newsletter/nl37/kwa-kuehleff-begruen

# GREECE

# ERASMUS+ REPORT

# An eco-friendlier buildingforour school



December 2024

5th High School of Agrinio, Greece

Power of Digitalization in Fighting Against Climate Change
2022-1-IT02-KA220-SCH-000086101

## Contents

# 1. Introduction

As climate change becomes an increasingly urgent global concern, the role of digitalization in promoting sustainability has never been more crucial. Through the Erasmus+ project ***Power of Digitalization in Fighting Against Climate Change*** (2022-1-IT02-KA220-SCH-000086101) our school has embarked on a mission to design a 3D eco-friendly building that reduce environmental impact while fostering innovation in education (Dash & Mohan, 2018). By integrating digital tools with sustainability principles, we aim to create a model for environmentally responsible school infrastructure that can serve as an inspiration for other institutions (Omole et al., 2024; Udomiaye et al., 2018).

This report presents our approach to incorporating digital technology in sustainable architecture, focusing on designing environmentally friendly buildings within our school premises. We employed advanced 3D modeling techniques to develop energy-efficient structures that maximize natural resources, incorporate sustainable materials, and utilize smart design strategies to minimize environmental impact. Our design process was guided by principles of green architecture, emphasizing passive solar design, rainwater harvesting, and enhanced insulation for energy conservation.

To ensure a systematic and data-driven approach, we followed a structured methodology that included extensive research on sustainable construction practices, hands-on experience with 3D modeling software, and iterative design improvements based on feedback by other teachers and students.

By bridging technology and sustainability, we provide a practical example of how educational institutions can contribute to climate action while fostering digital literacy and environmental awareness among students.

This initiative not only enhances our school s sustainability efforts but also aligns with global movements towards green architecture and smart cities. Through this project, we hope to inspire other schools and communities to embrace digitalization as a powerful tool in creating a greener and more sustainable future.

# 2. Methodology

To successfully design an **eco-friendlier building for our school** as part of the Erasmus+ project *Power of Digitalization in Fighting Against Climate Change*, we followed a structured methodology consisting of six key steps:

**1. Team Formation**

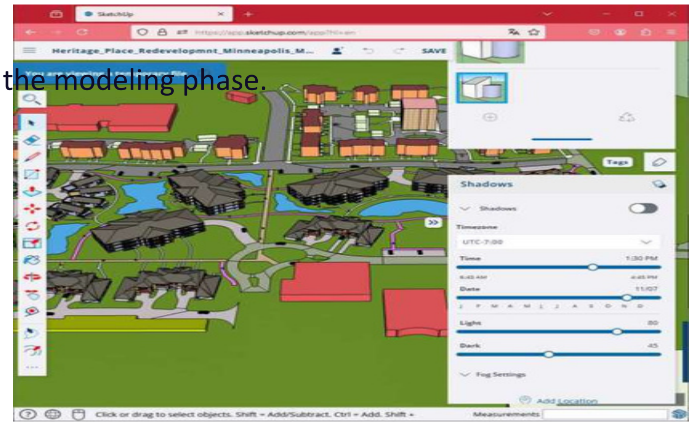
The first step involved assembling a team of students and teachers with diverse skills, including sustainability research, digital modeling, and architectural design. Each team member was assigned specific roles and responsibilities to ensure efficient collaboration throughout the project.



**2. Project Update**

To maintain progress and alignment with project goals, we conducted regular meetings and updates. These sessions allowed us to refine our approach, share new insights, and address

**3. Software Training** A crucial part of our methodology was gaining proficiency in 3D modeling software. We explored the features of various digital tools for architectural design, learning how to create accurate and realistic representations of eco-friendly school buildings. This training ensured that all team members could contribute effectively to the modeling phase.




*Example of software for 3D-Modelling*

**4. Photographs with Drone**

To create precise 3D models of our school, we utilized drone photography to capture detailed aerial images of the existing building and surrounding environment. These images served as a reference for our digital models, allowing for accurate replication of structures and landscape features.

**5. 3D Modelling of the School**

Using the data collected, we developed 3D digital models of sustainable school buildings. Our focus was on incorporating eco-friendly elements such as energy-efficient materials, optimized spatial layouts for natural lighting and ventilation, and green roofing solutions. Multiple iterations of the models were created and evaluated to achieve the most sustainable design.

**6. Presentation of the Work**

The final step involved presenting our findings and showcasing our 3D models. We prepared visual representations, a report and a presentation to explain our design choices, sustainability considerations, and potential impact on reducing the school s carbon footprint. The results were shared with peers, teachers, and the broader school community to promote awareness of digitalization in sustainability.

This structured approach ensured that we effectively combined digital tools with sustainability principles, demonstrating how digitalization can play a key role in designing climate-friendly educational environments.

# 3. Results

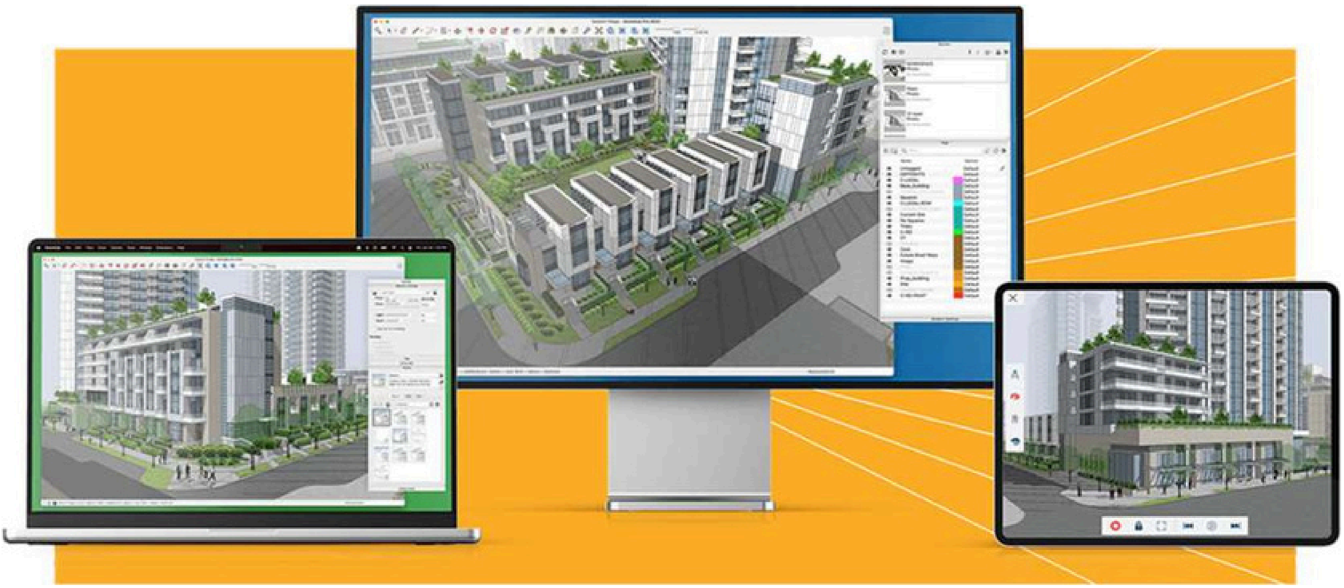
Through the Erasmus+ project, we utilized 3D modeling technology to design a more eco-friendly version of our school building. By integrating sustainable elements into the design, we explored practical ways to reduce our school's environmental footprint.

**1. SketchUp as a Digital Design Tool**

For this project, we used SketchUp, a powerful 3D modeling software, to visualize and refine our school s eco-friendly transformation (Jacobs, 2022; Brock, 2018). The tool provided several key advantages:

- User-Friendly Interface: SketchUp allowed us to quickly create and modify designs with an intuitive and easy-to-learn interface.
- Precision in Design: The software enabled us to develop accurate 3D models of our school, considering dimensions, spatial layout, and environmental factors.
- Sustainability Simulation: By using SketchUp extensions, we could analyze lighting conditions, energy efficiency, and airflow, helping us design a structure that optimizes natural light and ventilation.
- Integration of Renewable Energy Features: The software allowed us to place solar panels, wind turbines, and other green elements into the model, ensuring they were positioned for maximum efficiency.

With SketchUp, we created a realistic, functional, and sustainable redesign of our school, integrating eco-friendly features that support renewable energy use, waste reduction, and green spaces.



*SketchUp - https://www.sketchup.com/en*

**2. Eco-Friendly Additions to Our 3D Model**

In our redesigned school model, we incorporated several sustainability features to improve energy efficiency and environmental impact.

**Solar Panels**

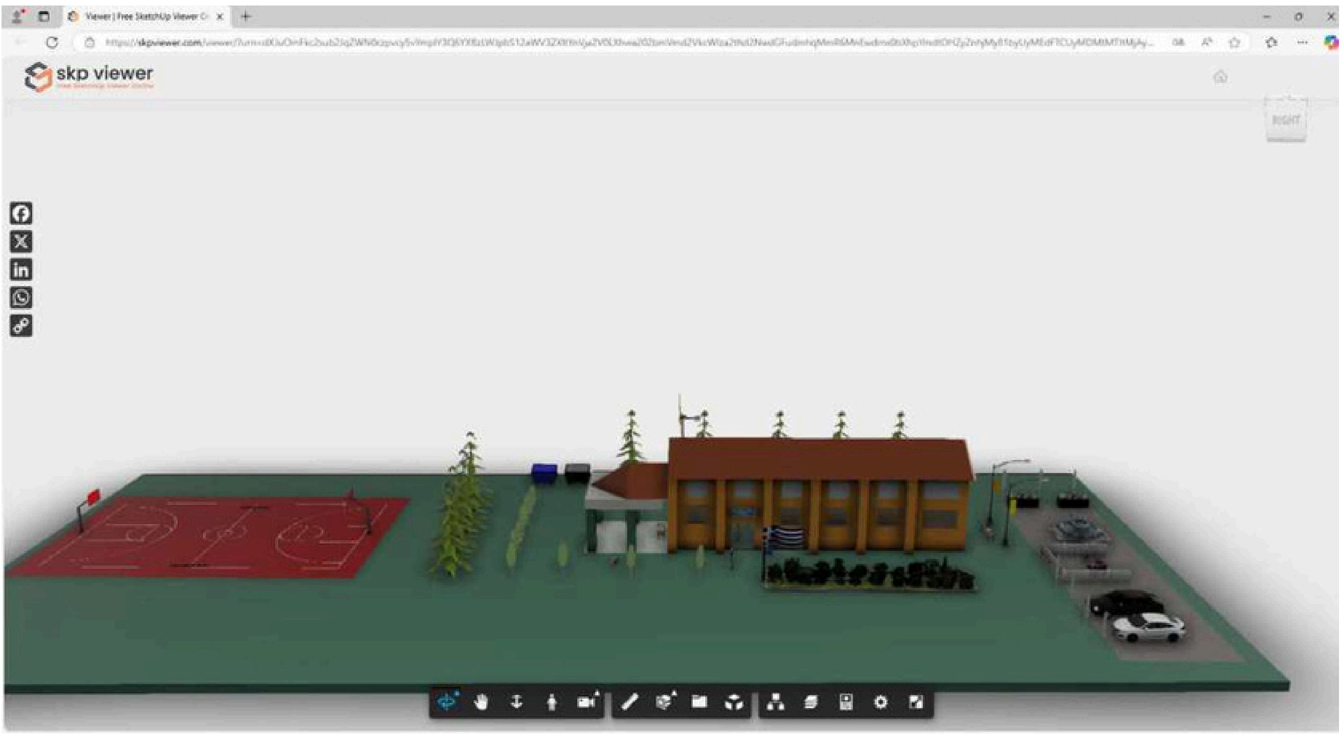
To reduce reliance on conventional energy sources, our model includes solar panels on the school s roof. These panels capture sunlight and convert it into electricity, helping to lower energy costs and reduce carbon emissions.

**Wind Turbine**

A small wind turbine was added to our design to harness wind energy and complement the solar power system. This feature diversifies the school's renewable energy sources and ensures continuous power supply even when solar energy is low.

**Compost and Recycling Bins**

To promote waste reduction, we integrated compost bins for organic waste disposal and recycling stations throughout the school grounds. This system encourages students and staff to separate waste efficiently, reducing landfill waste and fostering sustainable habits.




*3D design of our school - https://shorturl.at/PUpfb*

**Vegetable Garden**

Our 3D model includes a dedicated vegetable garden where students can grow fresh produce. This feature serves as an educational tool, teaching students about urban agriculture, food sustainability, and healthy eating while reducing the school's dependence on external food sources.

**Several Trees and Green Spaces**

To improve air quality and create a more pleasant learning environment, we incorporated multiple trees and green spaces around the school. These trees reduce $CO_2$ levels, provide natural shade, and improve biodiversity. Additionally, they enhance natural cooling, helping to regulate the school s temperature
and reduce air-conditioning energy consumption.

*Different view point of the 3D design of the school*

# 4. Conclusion

By using 3D SketchUp, we successfully designed an eco-friendlier school building that integrates renewable energy, waste management solutions, and green spaces. Our model demonstrates how digital tools can support climate-conscious urban planning, providing a realistic vision for sustainable school infrastructure.

Through this initiative, we not only explored digitalization in environmental design but also developed a practical and scalable approach that other schools can adopt to contribute to climate change mitigation.

# 5. References

Brock, J. G. (2018). *SketchUp for Builders: A Comprehensive Guide for Creating 3D Building Models Using SketchUp*. John Wiley & Sons.

Dash, G., & Mohan, A. K. (2018). Promoting healthy and eco-friendly school through students participation. *Indian Journal of Public Health Research and Development*, 9(3), 59-64.

Jacobs, H. L. (2022). SketchUp and Sketchfab: Tools for Teaching with 3D. *Journal of the Society of Architectural Historians*, 81(2), 256-259.

Omole, F. O., Olajiga, O. K., & Olatunde, T. M. (2024). Sustainable urban design: a review of eco-friendly building practices and community impact. *Engineering Science & Technology Journal*, 5(3), 1020-1030.

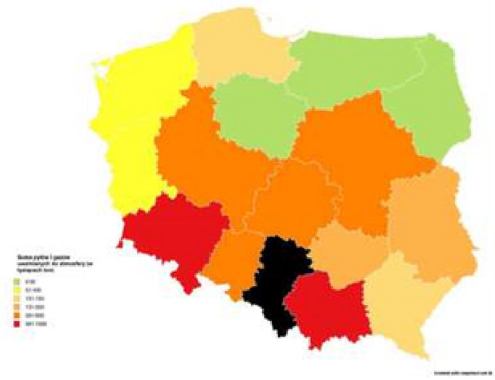
Udomiaye, E., Okon, I. U., Uzodimma, O. C., & Patrick, N. (2018). Eco-friendly buildings: the architect s perspectives. *International Journal of Civil Engineering, Construction and Estate Management*, 6(2), 14-26.

# POLAND

# *ZSIPO POLAND -* 3D Ecological LandModel:AMini-Article

## 1.*INTRODUCTION*

Problem Status and Motivation



The escalating effects of climate change have posed a severe threat to ecosystems, biodiversity, and human livelihoods **all over the world.** Extreme weather events, rising sea levels, deforestation, and habitat loss are some of the many manifestations of this global crisis.

Climate change is also significantly impacting **Poland**, manifesting through various environmental changes:

- Temperature Increase

Since the mid-20th century, Poland's average temperature has risen by approximately 0.29°C per decade, totaling an increase of just over 2°C. Notably, in the past two decades, the rate of warming in Poland has surpassed the global average. This warming trend is more pronounced in the eastern and western regions compared to the central areas.

- Altered Precipitation Patterns

While annual total precipitation has shown a slight increase, significant changes have been observed in seasonal distribution. Autumn and winter months, especially March, have experienced increased precipitation, whereas summer months have seen a decrease. These shifts contribute to longer-lasting droughts and sudden heavy rainfall, elevating the risks of wildfires and crop failures.

- Sea Level Rise

Studies indicate that sea levels along Poland's coast have been steadily rising, with 2020 levels being 13-15 cm higher than those in 1950. This rise poses threats to coastal ecosystems and increases the risk of flooding in low-lying areas.

- Ecosystem and Biodiversity Changes

Climate change, coupled with human activities, is altering habitats in Poland, leading to the disappearance of certain ecosystems like raised mires and salt marshes. Additionally, the expansion of invasive species, such as the American mink and small balsam, threatens native biodiversity.

- Extreme Weather Events

Poland is increasingly experiencing extreme weather events, including heatwaves, droughts, and floods. For instance, in September 2024, torrential rains brought by Storm Boris led to deadly flooding in Central Europe, including Poland. Studies have found that human-caused climate change doubled the likelihood of such events.

- Economic Implications

The World Bank reports that decarbonizing Poland by 2050 could boost the country’s GDP by 4%. However, achieving this would require an investment of around $450 billion. The transition aims to cease coal mining for energy by 2049 and align with the EU’s carbon neutrality goal by 2050.
These examples underscore the multifaceted impacts of climate change on Poland, affecting its environment, biodiversity, and economy.
Climate change is impacting regions worldwide, including our home town and location of **ZSiPO - Skała in Lesser Poland (Małopolska).**


In Małopolska, climate change has led to reduced water resources, affecting local communities and ecosystems.

Additionally, the region faces increased soil erosion due to changing precipitation patterns and land use. Studies have assessed soil erosion risks in Małopolska, highlighting the need for sustainable land management practices to mitigate these effects.
In response to climate change, there is a growing interest in innovative agricultural practices in Poland, including viticulture (grape cultivation). Research suggests that climate change may create favorable conditions for grape growing in certain regions, leading to the development of new agricultural opportunities.

Overall, the impacts of climate change in Skała and the broader Małopolska region underscore the importance of implementing adaptive strategies to address environmental challenges and promote sustainable development on every level including community of teachers, students and parents.

# 2. The 3D ecological Model

Environmental problems faced by schools in Skała, a small town in Lesser Poland, are significant and complex. These issues include poor air quality due to nearby traffic and industrial activity, limited green spaces, and improper waste management. Such conditions negatively affect students' health, learning environment, and overall well-being. To address these challenges, solutions can be explored through initiatives like the Erasmus program, which promotes environmental awareness and sustainability through international collaboration and educational projects.

Inspired by these ideas, our students developed a vision for Skała, focusing on creating a healthier and more sustainable environment. They incorporated renewable energy sources, green infrastructure, and innovative urban planning into their design. This project not only highlights the creativity of our students but also provides a blueprint for transforming Skała into a greener, more livable space for future generations.

Motivated by the urgency to address these challenges, we developed a 3D ecological land model as a tool to visualize and strategize sustainable land management. Our model aims to provide a tangible representation of ecological balance, showcasing how integrated land-use strategies can mitigate climate change impacts.

2.1. Goals:

- Demonstrate the interconnection between land use, biodiversity, and climate resilience.
- Provide a tool for educating policymakers, students, and the public about sustainable land management.
- Highlight practical strategies to restore ecosystems and reduce greenhouse gas emissions.
- Inspire collaborative efforts in combating climate change through community-driven solutions.
- Educate local communities
- Educate ZSiPO school community

2.2 Questions:

- How can a 3D ecological land model contribute to understanding sustainable land management?
- What specific strategies can be visualized through the model to combat climate change?
- How effective is the model in educating stakeholders about the importance of ecological balance?

Our concept envisions a small yet thriving sustainable community that seamlessly integrates renewable energy solutions, traditional infrastructure, and cutting-edge technologies, creating a harmonious balance between modernity and nature.

2.3. Description of the model:

- Central Residential Area

At the heart of the design lies a residential zone featuring a collection of cozy, family-oriented houses. These homes, adorned with sloping roofs and quaint chimneys, are surrounded by manicured green lawns and vibrant flower beds, reflecting a peaceful suburban lifestyle. The chimneys gently release wisps of smoke into the crisp air, suggesting a blend of conventional heating systems and hybrid technologies such as wood stoves or solar-thermal solutions. These details give the community a warm, inviting atmosphere while emphasizing sustainability.

- Renewable Energy Features:

    - Wind Turbines and Solar Integration

To the left of the community, a cluster of sleek wind turbines rises gracefully against the skyline. Strategically positioned in open spaces, these turbines harness wind power with optimal efficiency, symbolizing the community's commitment to renewable energy. Their modern design contrasts subtly with the traditional windmill in the background, a nod to the evolution of energy technology over the centuries.

- Pond and water tank

Nearby, a picturesque pond enhances the scenery, bordered by reeds and walking paths. This multifunctional water body may serve as a reservoir for irrigation, an aquaculture hub, or a tranquil space for leisure and relaxation. Adjacent to the pond, a futuristic dome-shaped building showcases innovative architecture, possibly housing advanced research facilities, community meeting spaces, or hydroponic farming units. Together, these elements symbolize the union of historical and futuristic approaches to community building.

- Hybrid Energy Systems

On the right-hand side, the landscape is dotted with additional wind turbines that rise along gently sloping hills, reinforcing the community’s reliance on green energy. Below, the cooling towers of a traditional power plant emit vapor, hinting at a hybrid energy production model where fossil fuels or nuclear energy coexist with renewable alternatives. This pragmatic approach underlines the gradual transition from conventional to cleaner energy sources, ensuring reliability and sustainability.

- Infrastructure and Connectivity

A well-maintained road skirts the community's edge, linking it to nearby towns and transportation networks. Modern cars traverse the road, signaling the adoption of energy-efficient or electric vehicles within the community. Streetlights line the roadway, equipped with solar panels to provide safety and illumination at night while conserving energy.

- Security and Layout

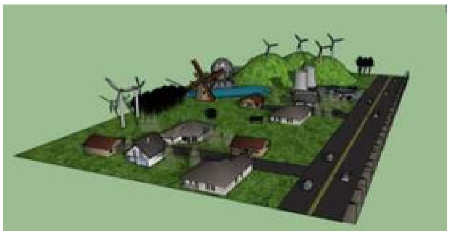
The community is neatly organized, with discreet barriers or fences surrounding its perimeter. These structures enhance security without disrupting the aesthetic appeal, preserving the open, inviting atmosphere. Green spaces abound, with parks, gardens, and tree-lined paths weaving through the neighborhood, offering residents areas to relax, socialize, and connect with nature.

- Architectural Harmony

The architectural styles throughout the community strike a balance between tradition and innovation. While the houses and windmill evoke nostalgia and heritage, the dome-shaped building and modern wind turbines point to a forward-looking vision. This thoughtful blend reflects a philosophy of learning from the past while embracing the future.

# 3. *Results*

1. Educational Tool: The model has proven effective in workshops and classrooms, enhancing understanding of ecological principles.
2. Policy Planning: Offers a visual aid for policymakers to evaluate the impact of proposed land-use strategies.
3. Community Engagement: Encourages local communities to participate in sustainable practices by providing a clear, relatable representation.
4. Usability: The model is portable, cost-effective, and adaptable to various contexts, making it accessible to diverse audiences.
5. Sustainability: Our model emphasizes low-cost, eco-friendly materials and promotes long-term ecological benefits by encouraging sustainable practices.



# *4. Suggestions for Future Research*

- Expanding the model to include marine ecosystems and urban green infrastructure.

- Developing digital 3D simulations to complement the physical model.

- Conducting longitudinal studies to assess the real-world impact of strategies visualized in the model.

# 5. *References*


1. 1. Smith, J., et al.(2018). Reforestation and Carbon Sequestration: A Global

   Perspective. Environmental Science Journal.
2. 2. Brown, P., & Jones, R. (2020). GIS in Land-Use Planning: Challenges and Opportunities. Land Management Review.
3. 3. United Nations (2021). Land Degradation Neutrality Report.
4. 4. Doe, J. (2019). Community-Based Land Restoration: A Case Study. Unpublished Master's Thesis.
5. 5. IPCC (2021). Sixth Assessment Report: Impacts, Adaptation, and Vulnerability.
6. https://en.m.wikipedia.org/wiki/Climate_change_in_Poland?utm_source=chatgpt.com
7. https://www.reuters.com/world/europe/polands-longest-river-record-low-after-scorching-summer-2024-09-09/?utm_
8. https://www.reuters.com/markets/carbon/decarbonising-by-2050-could-boost-polands-economy-by-4-world-bank-says-2024-11-05/?utm_

Erasmus+

# FRANCE

# Project: Making Our School More Eco-Friendly

## Introduction

Wechose to work on Pierre Curie Middle School, a place we know well and appreciate. As students, we spend a large part of our day here, which allowed us to study its spaces and operations in detail to think about practical eco-friendly improvements.

In this report, we will present:

1. Our ideas to make the school more environmentally friendly
2. Digital tools like SketchUp and Canva, used to imagine and present our project
3. The benefits observed and challenges faced during our work

The main goal of this project is to find solutions to reduce our school's ecological footprint. These initiatives should bring lasting environmental, economic, and social benefitsforeveryone.

# 1. Our Ideas to Make the School More Eco-Friendly

### a) Solar Panels: Sustainable Energy

✅ **Why install solar panels?**

Our first idea was to install solar panels on the school's roofs: a simple, sustainable, and effective solution to reduce our dependence on fossil fuels while decreasing greenhouse gas emissions.

🔍 **Our research highlighted several key points:**

- **Average school consumption**: About 100,000 kWh/year, which is the average consumption for a school of our size according to ADEME (Source: ADEME Guide on Energy Efficiency in School Buildings).
- **Installation cost**: Between €100,000 and €150,000 to cover energy needs, with a power of 90 to 100 kWp. These estimates are based on the average installation price of €1,100 to €1,500 per kWp in France in 2023 (Source: Ministry of Ecological Transition).
- **Savings made**: Up to €15,000 per year, by using 70-80% of the energy produced. Additionally, selling excess electricity could earn between €1,600 and €2,000 per year, for total returns ranging from €11,600 to €16,600/year. The buyback rate for surplus electricity by EDF OA is currently set between €0.10 and €0.13 per kWh (Source: EDF Obligation d'Achat).
- **Maintenance**: Low cost, about €300 to €500 every 5-10 years, mainly for cleaning and technical checks (Source: INES - National Institute of Solar Energy).
- **Profitability**: This investment could be paid back in only 6-13 years. Solar panels have an estimated lifespan of at least 30 years, ensuring a significant return on investment (Source: Renewable Energy Union).

➡️ **Conclusion:**

Solar panels represent an environmentally sustainable and economically profitable solution. Their installation could greatly help reduce our environmental impact while allowing significant savings for our school.

## b) Wind Turbines: Promising Energy, but Limited

✅ **Why consider wind turbines?**

Installing wind turbines around the school seemed like another interesting possibility for generating green energy.

🔍 **Our research showed:**

- A single wind turbine with a power of 20-50 kW would be enough to cover part of the school's energy needs, according to ADEME data on small wind power (Source: ADEME - Small Wind Power).
- **Installation cost**: Between €50,000 and €250,000, depending on the size and power of the installation (Source: France Wind Energy).
- **Profitability**: Up to €10,000/year savings on electricity bills, plus €2,000 to €5,000/year from selling excess energy. Buyback rates are set by the Energy Regulation Commission (Source: CRE).
- **Constraints**: While exploring this idea, we discovered a major obstacle: installing wind turbines in the urban area where our school is located is impossible due to local environmental regulations (building density, low winds, noise constraints). These constraints are defined in the Local Urban Plan (PLU) and confirmed by the Amorce association, which lists the rules for implementing renewable energy in urban areas (Source: Amorce).

➡️ **Conclusion:**

Although this solution is innovative and beneficial environmentally, it is not applicable in our project context due to regulatory and urban constraints.

## c) Eco-Friendly School Bus

✅ **Why introduce an eco-friendly school bus?**

Finally, we imagined a low-emission school bus to effectively serve the different neighborhoods of Goussainville.

🔍 **Our objectives:**

- **Reduce road traffic** in front of the school by limiting individual trips made by parents in cars. According to ADEME, a school bus can replace about 30 individual cars, reducing CO2 emissions by 95% (Source: ADEME - School Mobility).

- **Decrease $CO_2$ emissions and air pollution**. An electric or hydrogen bus produces no direct pollution, unlike combustion vehicles (Source: Ministry of Ecological Transition - Clean Bus Development Plan).
- **Raise student awareness** about sustainable mobility while offering them practical and economical transportation.

🔗 **Additional benefits:**

- **Less traffic jams and noise** around the school. A CEREMA study shows that collective school transport can reduce peak-hour traffic around schools by 20-30% (Source: CEREMA).
- **A solution for families without vehicles**, promoting equal access to education.

➡️ **Conclusion:**

This project is realistic and applicable, and would have a positive impact for students, families, and the local environment. It's an initiative that would strengthen the quality of life in our town while contributing to ecological transition.

# 2. Digital Tools Used

## a) SketchUp: Visualize and Model Our School in 3D

To understand and visualize our school's infrastructure in detail, we used SketchUp, a 3D modeling software. This tool allowed us to create a realistic replica of the school and test our ideas, such as adding solar panels to the roofs.

💡 **Our methodology:**

1. **School measurements**:
    - Using Google Maps, we estimated the length and width of buildings using the built-in measuring tools. This method is recommended by educational resources like Éduscol for school projects.
    - Photos taken on site, compared to our own height (1.50 m for a student), allowed us to estimate the height of walls using cross multiplication.
2. **Modeling in SketchUp**:
    - Step 1: Creating basic shapes (Line and Rectangle tools in 2D).
    - Step 2: Converting to 3D volumes using the Push/Pull tool (based on our precise calculations).
    - Step 3: Adding details and textures to make the model more realistic (windows, roofs).

🚀 **Advantages:**

- Practical use of mathematics (cross multiplication, proportions).
- A realistic model that helped us identify available spaces for our ecological improvements.

- Practical application of digital skills recommended by the CRCN (Digital Skills Reference Framework) for secondary education (Source: Éduscol - CRCN).

📌 **Difficulties encountered:**

- SketchUp was the first 3D tool used by students. Its interface, although simplified, was not intuitive for beginners, which slowed down the work. This observation is confirmed by studies on learning 3D software in schools (Source: Sticef Journal).
- Limitations of measuring tools, especially on Google Maps, which do not provide precise details (e.g., window sizes).
- Some computers were unable to handle large files, causing slowdowns.

➡️ **Conclusion:**

Despite these challenges, SketchUp proved essential for designing a faithful model of our school and rethinking its infrastructure in an eco-friendly way.

## b) Canva: Present Our Project Elegantly

To prepare our oral presentation, we used Canva, an online graphic design tool.

💡 **Why Canva?**

- Simple and intuitive interface, even for design beginners.
- Many pre-designed templates that helped us save time and produce a professional result.
- Tool recommended by the National Education system for school productions (Source: Canopé Network).

🔗 **Benefits obtained:**

- Aesthetic results, capturing more attention during our presentation.
- Easier collaborative work thanks to simultaneous connection on multiple devices, in line with good digital collaborative work practices (Source: Pix - Digital Skills Assessment Platform).
- Accessibility from any internet-connected device, making homework easier.

📌 **Limitations:**

Some advanced features are only accessible in the paid Premium version, although the free version is more than enough for most school projects.

➡️ **Conclusion:**

Canva was an essential ally for organizing and visually enriching our final presentation.

## c) 3D Printer: Bringing Our Ideas to Life

We also used a 3D printer to produce a physical model of our school, based on our work in SketchUp.

🚀 **Advantages:**

- Concrete miniature prototype, making it easier to visualize ecological improvements.
- An attractive and innovative support for our presentation.
- Using this technology develops skills valued in the professional world, as highlighted by France Education International (Source: France Education International).

📌 **Difficulties:**

- Printing small details was difficult to adjust, a common problem with low-cost 3D printers used in schools, according to the report on FabLab technologies at school (Source: Éduscol - FabLab at School).
- Quite long printing time (several hours for a prototype).

## 3. General Conclusion

At the end of this project, we succeeded in:

1. Designing realistic solutions to reduce the school's ecological footprint (solar panels, school bus).
2. Using digital tools to transform our ideas into innovative and professional materials.

### Final proposal:

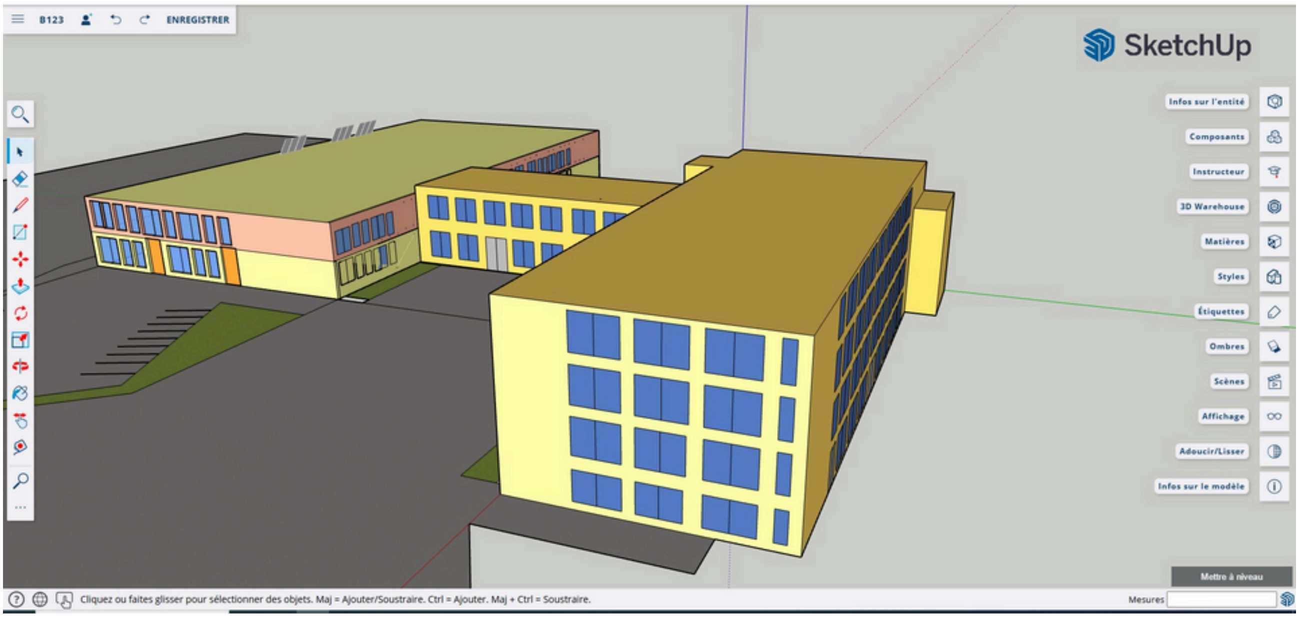
We recommend installing solar panels and setting up an eco-friendly school bus service. These economical and sustainable initiatives could start a transition toward an environmentally exemplary school.

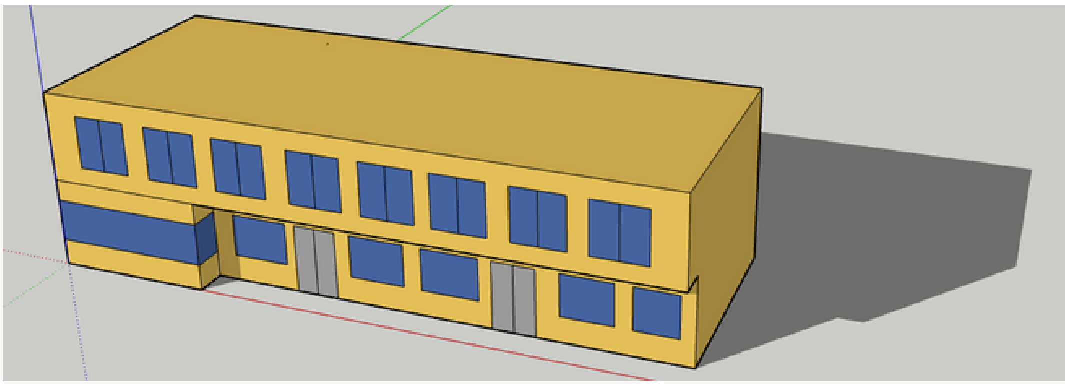
According to ADEME's "Energy Generation" program, schools that have implemented similar measures have reduced their carbon footprint by 30-40% on average over a 5-year period (Source: ADEME - Energy Generation Program).

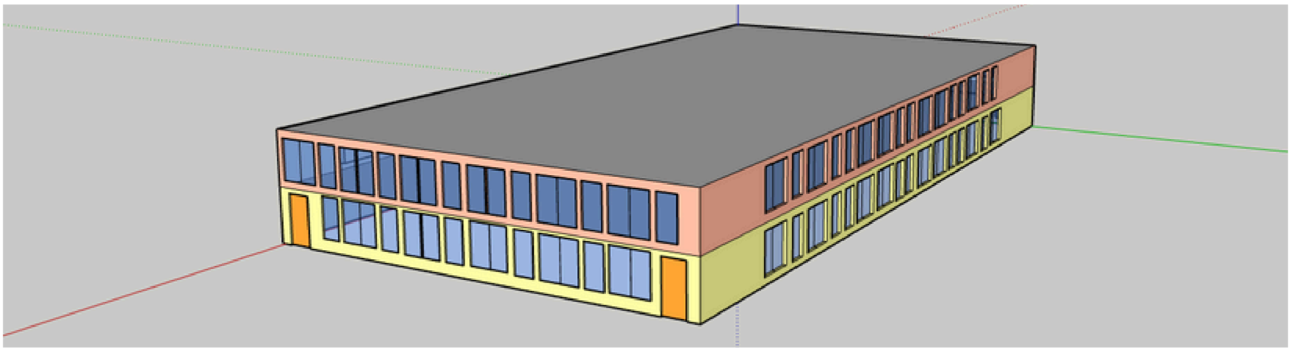
## Acknowledgments

We sincerelythankourteachers for their guidance and our classmates for their commitment to this collaborativeproject.

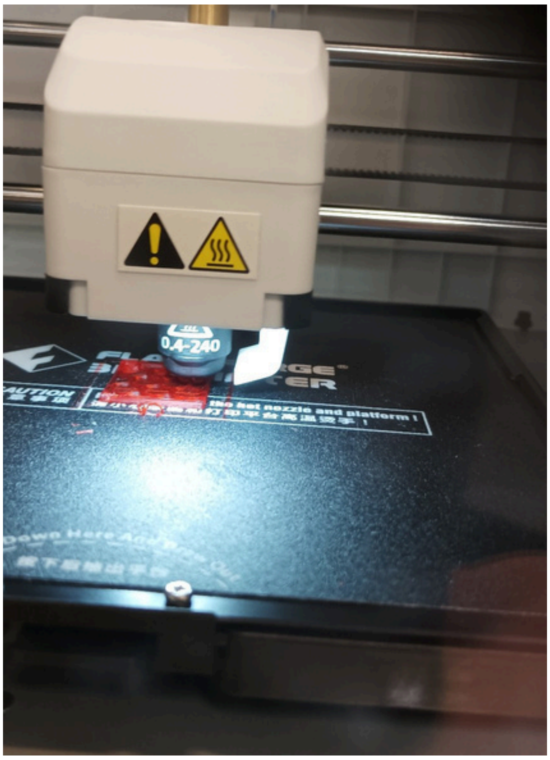
# Appendix 1: School creation in SketchUp.



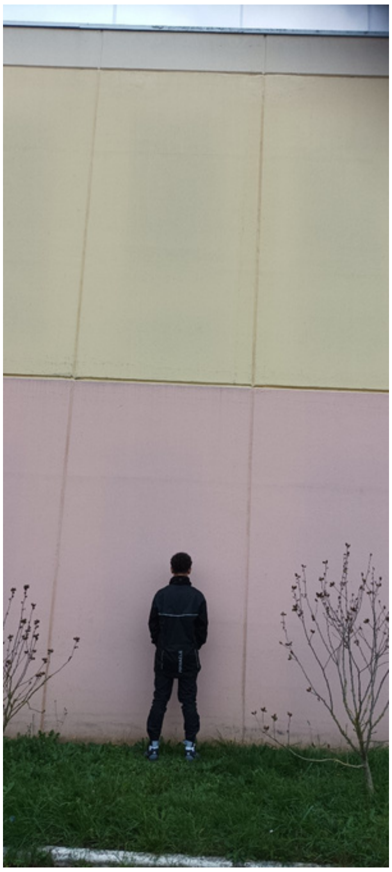





**Appendix 2: 3D printer in operation and general view.**




**Appendix 3: Photos of Bilal and Asma to obtain the school dimensions.**



Erasmus+

# CROATIA


POWER OF DIGITALIZATION IN FIGHTING AGAINST CLIMATE CHANGES
ECOLAND
PRESENTATION
CROATIA

# WHAT IS AN ECOLAND?

Ecoland is an eco-friendly destination or park. It is basically mix of nature and tehnology with renewable sources of energy. For example it can be a park with some modern gadgets.

# WHY DID YOU MAKE IT LIKE THAT?

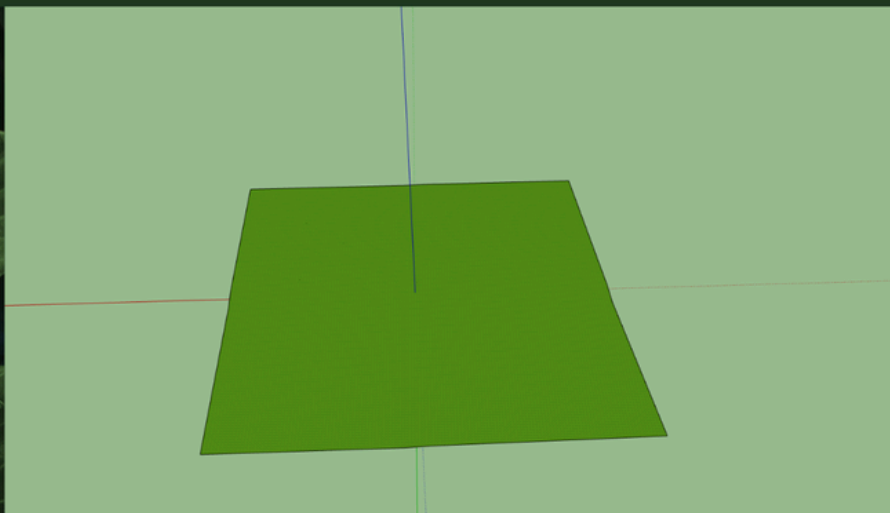
We made exactly this ecoland because that is how we imagine an ecoland.

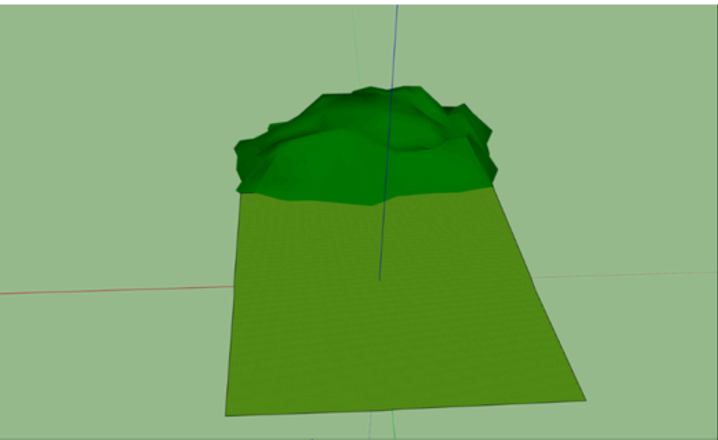
# STEPS

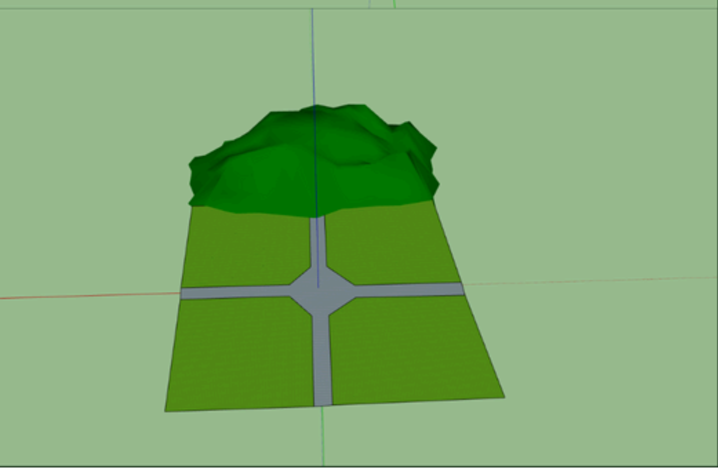
## OF MAKING THE ECOLAND

# STEP 1

- we made a platform
- we made it by drawing lines
- we colored it





# STEP 2

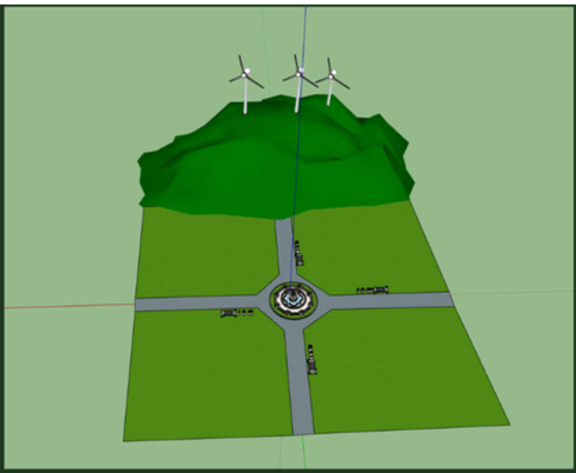
- we added a hill and we changed  it so it could fit
- we drew the lines and colored it inside
- the pathway sepatarates park in four parts

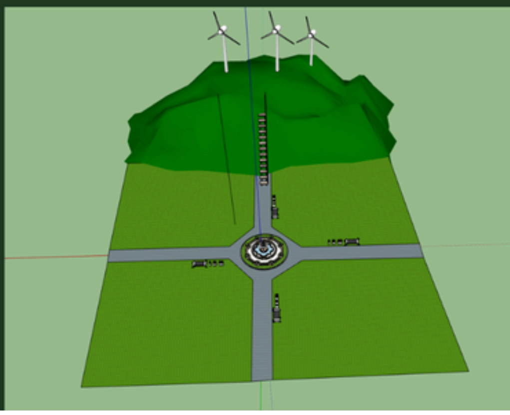
# STEP 3

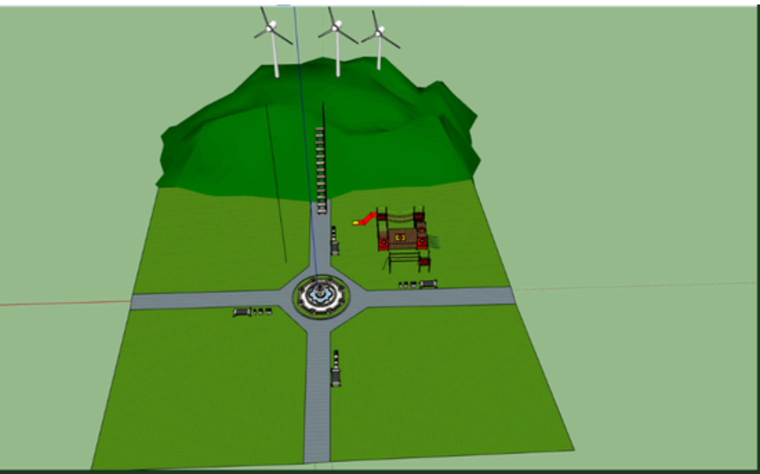
- we added a fountain and we located it at the center of the park
- we put benches with solar panels
- there are  recycle bins

# STEP 4

- we put wind turbines at the top of the hill
- we made a stairs that are leading you to the zipline





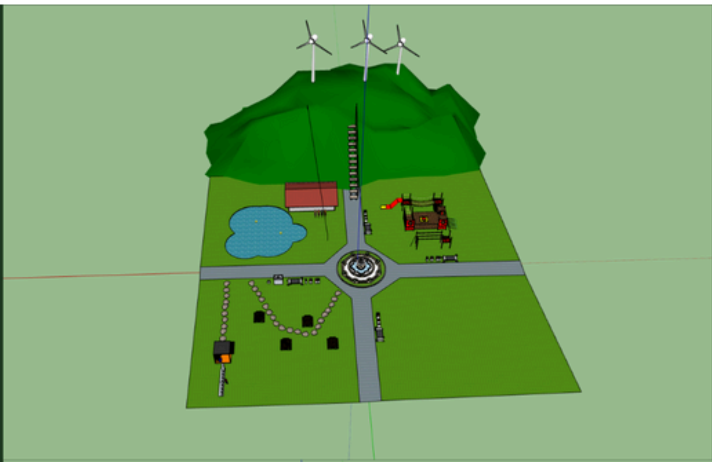


# STEP 5

- at the first part of the park, we put a playground
- at the second part of the park, we made a barn with horses and a small lake with ducks

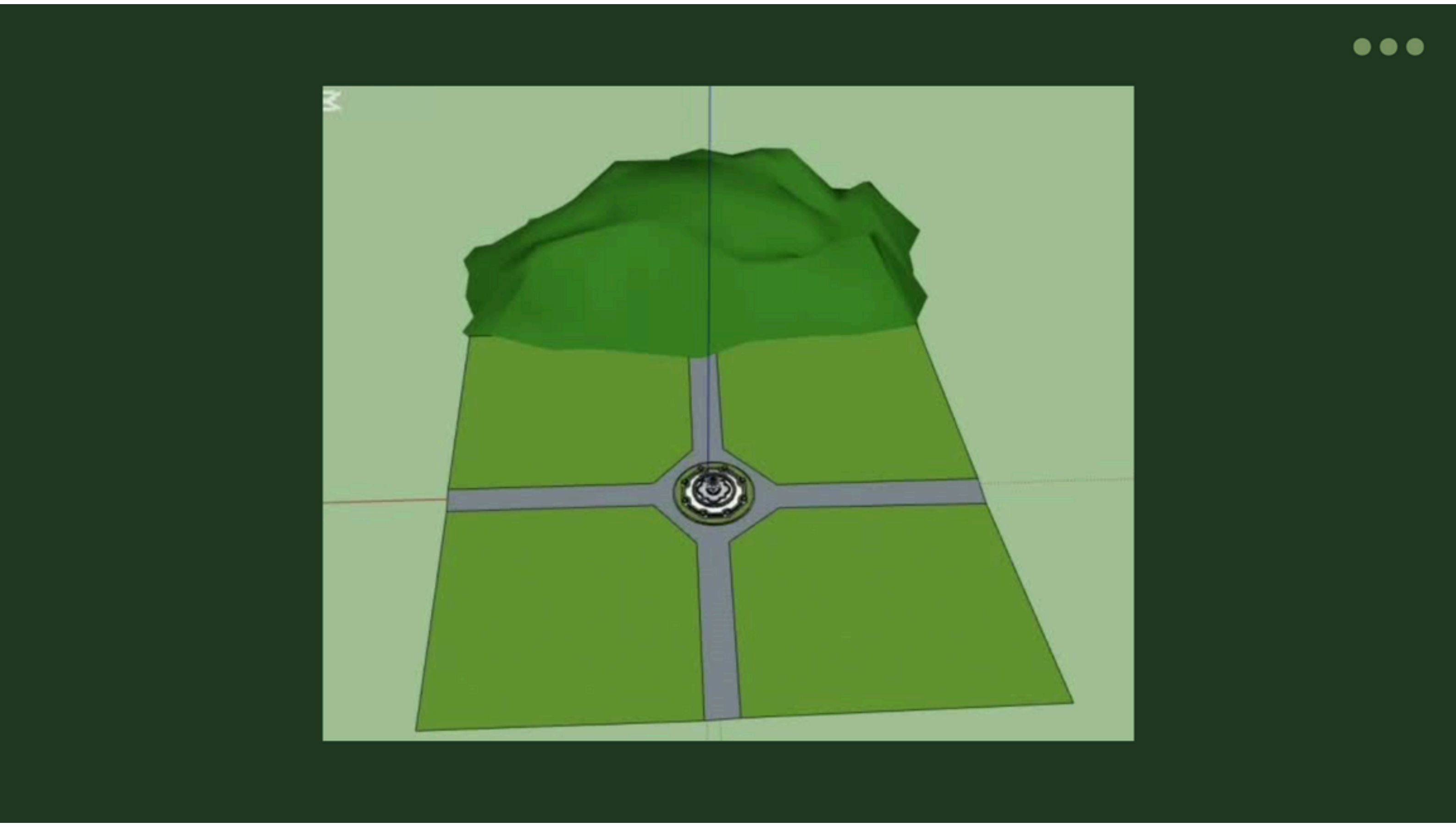
# STEP 6

- at the third part of the park, you can find a place where you can have a picnic, bike docking station
- at the fourth part of the park, there is a basketball court, a youth center, a charging station for electric cars and an outdoor cinema



# STEP 7

- we put solar panels in almost every part of the park
- we put trees because of improving air quality and because they are offering a habitat to wildlife



# THANK YOU FOR YOUR ATTENTION