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Training Tomorrow's Environmental Analysts

Vocational Training Programme for assisting in Mastering IoT and Sensor Technologies in Namibia, Rwanda and Zimbabwe

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Introduction

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What is Environmental Education (EE)?

Why is it relevant today?

What is Environmental Education?

Environmental Education is a process that helps individuals gain awareness of the environment and its challenges, develop the knowledge, skills, values, and experiences needed to understand and address environmental issues, and take informed, responsible action to improve and protect the natural world.

Modern VET frameworks emphasize a competence-based approach to Environmentl Education, which includes:

o **Cognitive competences**: understanding ecological systems and environmental legislation.

o **Technical competences**: applying green technologies and sustainable production methods.

o **Behavioral competences:** promoting pro-environmental attitudes and practices at the workplace.

What is Environmental Education?

o Addresses local challenges ▢   Desertification, deforestation, water scarcity, pollution.

o Empowers communities→ gives tools to manage natural resources sustainably.

o Improves health → through awareness about clean water, sanitation and waste.

o Promotes green jobs: in agriculture, energy, conservation and eco-tourism.

o Supports SDGs: aligns with the UN Sustainable Development Goals

Why is relevant Environmental Education in VET?

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o Prepares **future professionals** to address environmental challenges in their sectors.

o Encourages sustainable practices in daily operations and decision-making.

o Aligns with **EU Green Deal** and **labor market demands for green skills**.

o Promotes responsible citizenship and environmental awareness.

o Empowers **learners to become agents of change** in their workplaces and communities.

How IoT can help us raise environmental awareness?

How IoT can help us raise environmental awareness?

1. Real-Time Environmental Monitoring
IoT sensors (like DHT11, air quality sensors, etc.) can measure temperature, humidity, air pollution, water quality, and more. These data provide real-time insights into environmental conditions in cities, rural areas, and even remote ecosystems.

2. Data-Driven Education
Students and citizens can interact with live environmental data through dashboards and apps.
This fosters critical thinking and deeper understanding of local/global environmental issues.

3. Community Engagement & Action
IoT can alert communities to issues like poor air quality, droughts, or deforestation.
It encourages people to take action, from reducing pollution to advocating for change.

4. Transparent Reporting
Governments and NGOs can use IoT data to report progress on sustainability goals.
Increases public trust and keeps citizens informed.

5. Promotes Responsible Behavior
Smart devices at home (like smart meters or water sensors) help individuals monitor their consumption, reducing waste and emissions.

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Examples of digital technologies, with a focus on IoT, supporting environmental education

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- Administration of Networked Computer Systems

- Sales Management and Commercial Spaces

- Environmental Education and Control

- Telecommunication and IT Systems

- Production Programming in Mechanical Manufacturing

- Mechanical Design

- Industrial Automation and Robotics

Examples

1. Online **Applications** to understand the environment.

2. - Use of **SENSORS** to explain the environmental problems, climate crisis, etc.

DHT-11 + ESP32☐ Greenhouse effect

3. Evaluation and Control of the MEC-**workshop** with the use of different sensors

1. Using Google EARTH Pro in Environmental Education

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Application

o Compare historical imagery to observe the effects of climate change over time (e.g., glacier retreat, deforestation).

o Identify land use changes,

o Assess environmental impacts

o Develop mapping and geolocation skills

1. Using Google EARTH Pro in Environmental Education

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Materials:

Google Earth PRO
(Free app for PCs
and mobile phones)

Results:

- o Distance and Area Measurement
- o Path Tool for Route Creation
- o Custom Placemarks
- o Layer Visualization
- o Historical Imagery
- o Tour and Video Recording
- o Import GIS/KML/KMZ Data

1. Using GIS applications to interpret the environment
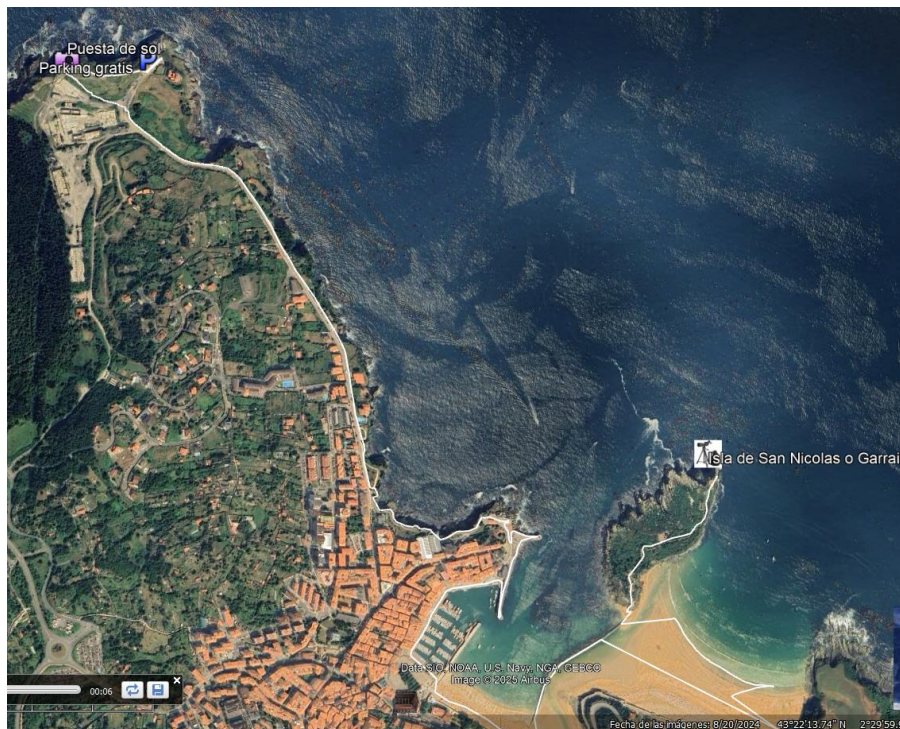
Results:

o Make a Tour
o Make Video Recording
o Import GIS/KML/KMZ

Geographic Information Systems

1 . Using GIS tools

1. GIS applications/tools to interpret the environment

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GEOEUSKADI → https://www.geo.euskadi.eus/inicio/
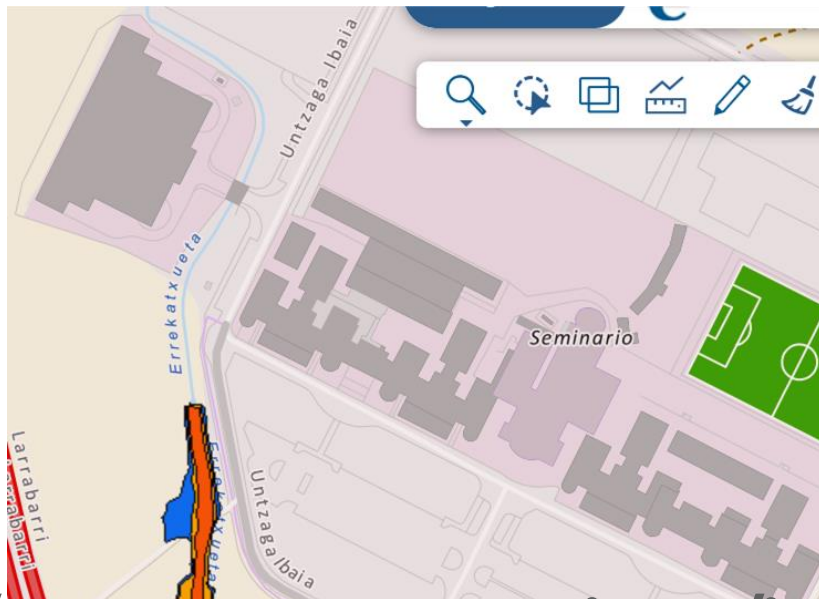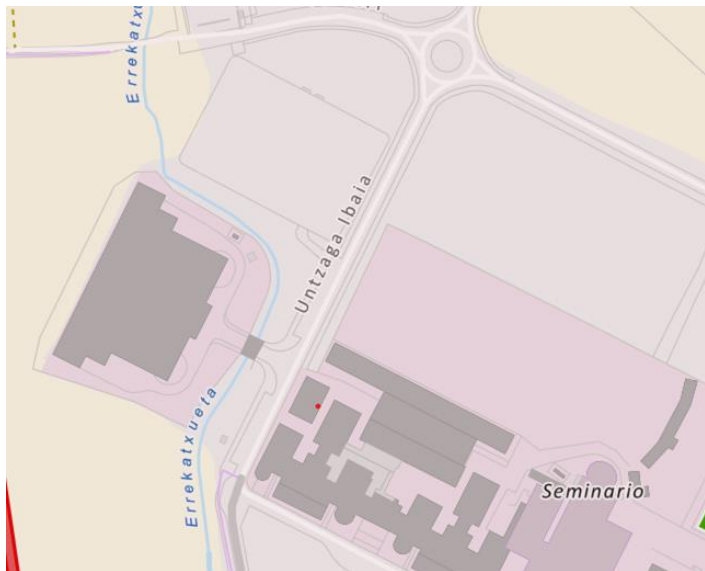
1. Using GIS applications/tools to interpret the environment
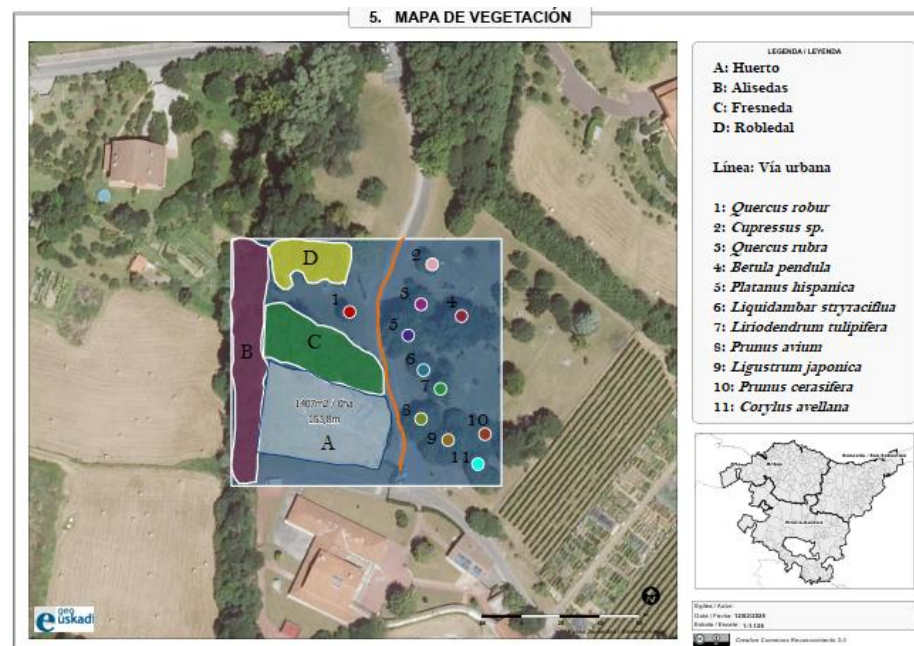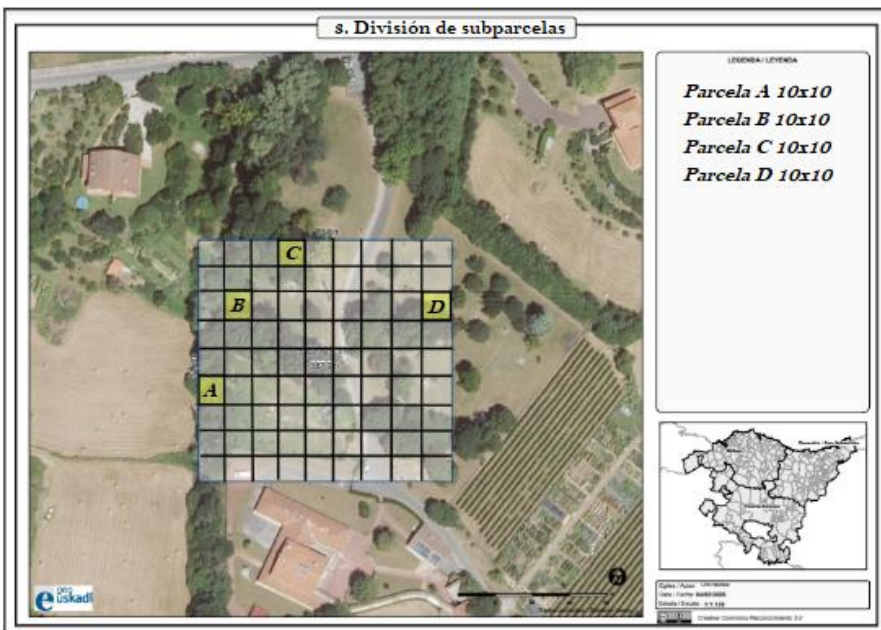
1. Creation of interactive projects with IOT

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STUDENT PROJ_1   STUDENT PROJ_2
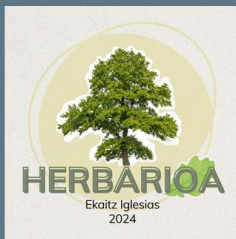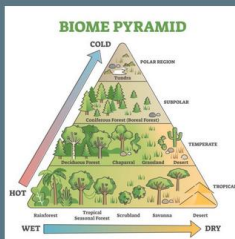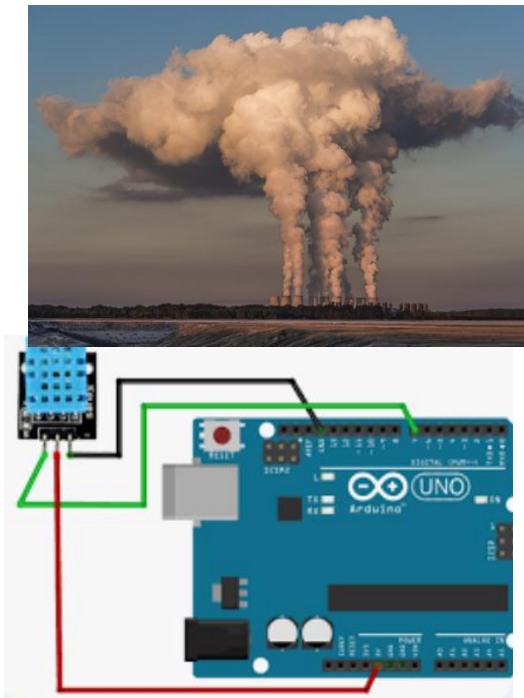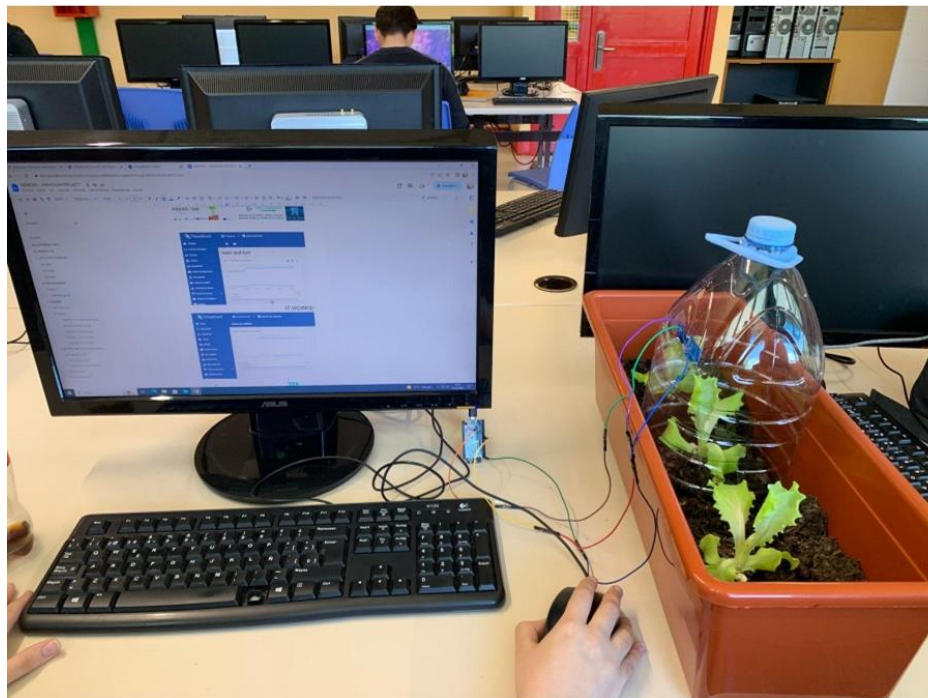
2. DHT11 Sensor & ESP32 to Understand the Greenhouse Effect

2. ESP32+SENSOR DHT 11+ARDUINO

Sensor measures → ESP32 reads → Sends data (to screen or cloud)

Materials

- ESP32 board
- DHT11 sensor (3 or 4 pins)
- Jumper wires
- Breadboard (optional)
- Arduino IDE installed
- DHT library installed

Application

Useful for agriculture, weather stations, smart classrooms or green projects.

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the European Union

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2. DHT11 Sensor & ESP32 to Understand the Greenhouse Effect

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What Students Learned:

o How heat and humidity behave in closed spaces.
o Practical understanding of the greenhouse effect through data.
o Connection between local data and global climate change.

o Boosts digital & technical skills.
o Encourages climate awareness and sustainable thinking.
o Demonstrates how IoT supports green education.

3. Digitalization and Sustainability in Machining Workshops

Waste Reduction and Control Systems

Energy Efficiency Improvement Systems
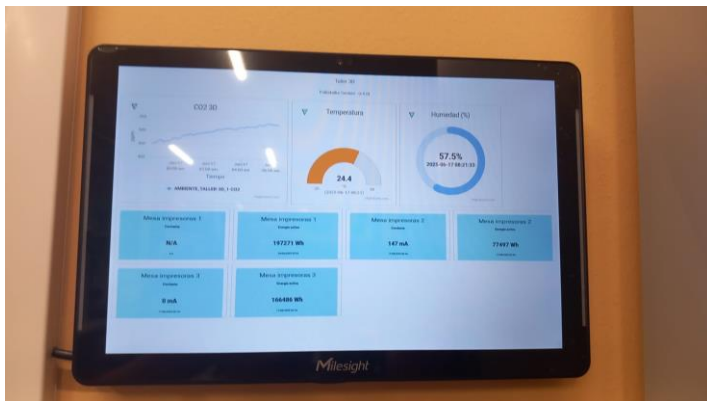
Digitalization and Environmental Monitoring

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Sensors

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Sensors

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RESOURCES
Recommended Guides (PDF)

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Tools for education:

- **Google Earth Pro: https://www.google.com/earth/versions/#earth-pro**

- **Mapbox: https://www.mapbox.com/**

- **ArcGIS Online for Education: https://www.esri.com/en-us/arcgis/products/arcgis-online/overview**

Mobile Apps for Field Data Collection

- **Mapillary: https://www.mapillary.com/**

- **ODK Collect: https://getodk.org/**

- **KoboToolbox: https://www.kobotoolbox.org/**

RESOURCES
Recommended Guides (PDF)

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Web GIS Platforms for Africa

- **Digital Earth Africa: https://www.digitalearth.africa/**

- **OpenStreetMap: https://www.openstreetmap.org/**

- **Africover by FAO: https://www.fao.org/geonetwork/srv/en/main.home**

- **ICPAC GeoPortal: https://geoportal.icpac.net/**

- **GeoNode Africa: https://geonode.org/**

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RESOURCES
Recommended Guides (PDF)

Arduino with ESP32 & Sensors:
https://randomnerdtutorials.com/esp32-esp8266-publish-sensor-readings-to-google-sheets/

DHT11 Sensor with ESP32
https://www.electronicwings.com/esp32/dht11-sensor-interfacing-with-esp32

https://es.scribd.com/document/518233602/ESP32-with-DHT11-DHT22-Temperature-and-Humidity-Sensor-using-Arduino-IDE-Random-Nerd-Tutorials?utm_source=chatgpt.com

Open Educational Resources (OERs)
https://oercommons.org/courses/environmental-science-5

Thank you

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