Núcleo Vita

Núcleo Vita: What future will you create for Earth?

By Núcleo Vita Bioñeros

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SUMMARY

NÚCLEO VITA is an educational video game that combines strategies with the aim of promoting environmental awareness in an interactive way. The project arose within the framework of the NASA Space Apps Challenge, based on data from the Terra satellite, the longest-running daily observer of Earth, which for more than 25 years has recorded key information about environmental changes and processes on the planet.

Based on this data, the game presents a timeline of real environmental events from 1999 to 2025 and then proposes hypothetical future scenarios in which the player must choose between different possible solutions. Each answer has a score that reflects its level of sustainability and environmental awareness, giving you an alternative future and food for thought based on your decisions.

Beyond entertainment, NÚCLEO VITA seeks to inspire critical thinking and informed action in the face of current climate challenges, integrating science, technology, and education into an accessible and meaningful digital experience.

PROJECT

https://youtube.com/shorts/4kRaD4EITW8?si=NfU_uvpfiTKrljWx

GITHUB

https://github.com/Angel1xs/N-cleo-Vita.git

PROJECT DETAILS

WHAT DOES IT DO?

NÚCLEO VITA is an educational climate simulation video game that transforms complex scientific data into an interactive and accessible experience, promoting environmental awareness and commitment.

The project develops an outreach tool that integrates real data from the Terra satellite (NASA) with simulation dynamics and decision-making. This allows users to:

-Understand the crisis: Travel through a timeline of relevant environmental events captured directly by Terra instruments (MODIS, MOPITT, ASTER).

-Decide the future: Make key decisions in hypothetical scenarios that affect the planet's course.

-Encourage reflection: Receive a personalized assessment detailing the impact of their choices on the future of Earth.

NÚCLEO VITA is a technical and educational solution that promotes understanding of environmental processes and their direct relationship to human actions.

HOW DOES IT WORK?

Núcleo Vita operates in a two-stage structure that combines data visualization with gamification of decision-making:

1. Contextualization Stage (1999–2025)

-Data visualization: The player navigates a timeline that begins with the launch of the Terra satellite in 1999.

-Real events: Critical environmental events are presented with data captured by onboard instruments (MODIS, MOPITT, ASTER).

-Objective: This intuitive stage allows the user to understand the evolution of climatic and ecological phenomena that have impacted the planet up to the simulated present (2025).

2. Simulation and Decision Stage (2025–2035)

-Hypothetical scenarios: The user is in command in the year 2025 and must make a key decision each year for the next decade.

-Decision-making: For each environmental crisis (oil spill, heat wave, water shortage), four possible solutions are offered.

-Scoring system: Each choice is evaluated with a score that determines its level of sustainability.

-Final result: The total accumulated score generates a personalized final evaluation, revealing the impact of your decisions on alternative futures for the planet in 2050.

The solution transforms satellite data into a participatory experience, contributing to the development of a more informed and committed environmental culture.

KEY BENEFITS

NÚCLEO VITA offers benefits in the following areas:

Educational and Cognitive:

Transformation of scientific data, development of critical thinking, meaningful learning.

Dissemination and Social Connection:

Strengthening science-society relations, fostering engagement.

Application and Versatility:

Multifunctional tool, policy simulator.

EXPECTED IMPACT

1. Public Awareness and Education: Increase public understanding, high-value educational resource.

2. Research and Policy Support: Support for academic research, information for policy-making, civic and social engagement, promotion of responsibility.

TECHNICAL STACK

Various programming and collaborative management tools were implemented for the development of NÚCLEO VITA. In the field of video game development, languages such as Python, Java, HTML, and CSS were used, integrated into the Visual Studio Code programming environment, which allowed for structured, versatile work compatible with multiple platforms.

Various Python libraries were used, including Matplotlib, NumPy, Dash, ImageIO, OS, Cartopy, Webbrowsery Subprocess, which facilitated the creation of interactive graphics, data manipulation, map visualization, and the integration of dynamic components within the game. Artificial intelligence tools such as Avacus, ChatGPT, and Gemini were used to generate translations.

All information, source code, and development progress are stored and managed on the GitHub platform, where the five team members collaborate. This tool allows for

efficient version control, ensures project traceability, and facilitates simultaneous work among participants, guaranteeing the consistency and integrity of NÚCLEO VITA's development.

USE OF ARTIFICIAL INTELLIGENCE (AI)

USE OF AI TOOLS

Our team used AI tools in the following aspects of this project:

1. Code development and optimization

ChatGPT/GPT-4, Gemini, and Abacus were used for:

-Planning the initial project structure and architectural design

-Debugging and troubleshooting during development

-Code optimization suggestions to improve performance

TRANSPARENCY IN THE USE OF AI

CODE AND DATA

-All AI-generated code was thoroughly reviewed, tested, and modified by our team.

-The core application logic and rules were developed by team members.

-AI was used as a productivity tool, not as a replacement for human coding.

-Final implementation and architecture decisions were made by the development team.

-It was used to translate Python into other languages.

IMPORTANCE OF THE PROJECT

This project is crucial because it directly addresses the gap between scientific evidence and citizen action. It transforms the role of data: from being merely warning information to being the basis for active decision-making.

NÚCLEO VITA is a vital tool for creating an informed environmental culture that understands science, takes responsibility, and is prepared to act in the crucial coming decade.

BUSINESS MODEL

To develop our project, we will use the “SaaS” (Software as a Service) business model.

In this business model, our users can connect to the application through the cloud, which facilitates access from any geographical location, as long as there is an internet connection.

Thanks to this type of business model, users will have access to up-to-date software and will only pay for what they use.

Traditional software usually represents a large initial investment and offers limited features in return. Updates come in the form of new software versions that must be purchased and installed. But your company also needs power, servers, and storage to manage applications and data. If something goes wrong, you have to fix it yourself. And if your company suffers the consequences of a data breach or natural disaster, you could lose access to important applications and information.

The SaaS model is very different. It is a subscription service, with pricing options that suit both individual users and groups. In addition, the software is hosted on the providers' servers. That means there is no need to worry about hardware maintenance, applications and data are always backed up, and updates are automatic. What's more, many providers offer training to help users get the most out of the software.

SCALABILITY

The scalability of NÚCLEO VITA is approached on three levels: technical, educational, and social.

On the technical level, the video game can be developed under a modular architecture that allows new functions and content to be integrated without altering its basic structure. This includes the progressive incorporation of data from the various instruments on the Terra satellite, as well as the possibility of adding information from other satellites or open sources from NASA. The system could be

hosted in the cloud to ensure its availability, automatic updates, and simultaneous access by users in different regions of the world.

At the educational level, the project can be scaled up by creating specific versions of the game adapted to different age groups or academic levels. For example, a school version geared toward teaching environmental science, and another aimed at the general public focused on global decision-making. A panel could also be included for teachers or institutions that wish to use the game as a teaching tool, allowing them to evaluate student results and encourage collaborative learning.

At the social level, NÚCLEO VITA can expand as a participatory environmental awareness platform, where users contribute ideas, scenarios, or sustainable actions that are integrated into the game through regular updates. This interaction would allow for the creation of an active community interested in protecting the planet and strengthen the connection between science and citizens.

The growth path includes testing phases in educational and scientific outreach environments (schools, fairs, museums, innovation centers), with metrics focused on the number of players, learning levels achieved, and degree of understanding of environmental issues.

TEAM

Ángel Gabriel Granados Ortiz (23 years old) — Student pursuing a Bachelor's Degree in Biomedical Technologies. He serves as the lead software developer, leading the video game's programming and ensuring the technical integration of the project's various modules. Responsible for creating the repository on GitHub, where all members subsequently collaborated by adding content and actively participating in the interaction within the platform.

Grecia Daniela Valdivia Rubio (24) — Student pursuing a Bachelor's Degree in Biomedical Technologies. She collaborates in the development of images and animations for the game, in the translation into English, and in the creation of the voice for the project pitch. She also provided support in the overall structure of the code and participated in the collaboration and updating of the GitHub repository together with the rest of the team.

Natalia Vanessa Rodríguez Cervantes (19 years old) — Student pursuing a Bachelor's Degree in Biomedical Technologies. She assists in the design and structure of the code, contributes historical content for the game's narrative, conducts research relevant to its development, and contributes to the preparation of the final documentation. She actively participated in the collaboration and management of the GitHub repository.

Gloria Millet Velázquez Álvarez (19) — Student in the Bachelor's Degree in Biomedical Technologies. She contributes creative ideas for the pitch documentation, assists in structuring the evaluation of questions within the code, and collaborates in the design area, including the logo and visual identity of the project. She also participated in editing and contributing materials within the GitHub repository.

Eddy Armando De la Cruz Huezo (32 years old) — Radiology technician and student of the Bachelor's Degree in Biomedical Technologies. He supports the development of the code, collaborates in the technical optimization of the video game, and in the preparation of part of the final documentation. He also participated in updating and contributing content within the GitHub repository together with the rest of the team.

NASA DATA:

https://terra.nasa.gov/data

https://search.earthdata.nasa.gov/

https://terra.nasa.gov/data/modis-data

https://terra.nasa.gov/data/aster-data

https://terra.nasa.gov/about/terra-instruments/mopitt

SPACE AGENCY PARTNER AND OTHER DATA:

https://modis.gsfc.nasa.gov/data/dataprod/mod02.php

https://terra.nasa.gov/about/terra-instruments/mopitt