Green IT
Project report

Green Cards

LEBRAS Valentin, ROUGIER Jules, SOT Anatole, VAIO Lorenzo

Table of contents

Part 1 - Website Presentation

Introduction of the project

This GreenIT project was aimed to apply all the different notions we learned during the course, concerning the minimization of the environmental impact of technology. In this particular case, we are asked to create a website that needs to be completely functional and have a database associated with it to perform CRUD actions.
The main point that differentiates this GreenIT project compared to other website projects we have at EFREI, is that this particular website needs to be optimized so that its carbon footprint and environmental impact is as low as possible.

To do that, we can apply the different good practices that we saw during the first five parts of the GreenIT course.

We organize ourselves to work on both discord for communication and most obviously Github, to ensure version control and a good workflow of the project.

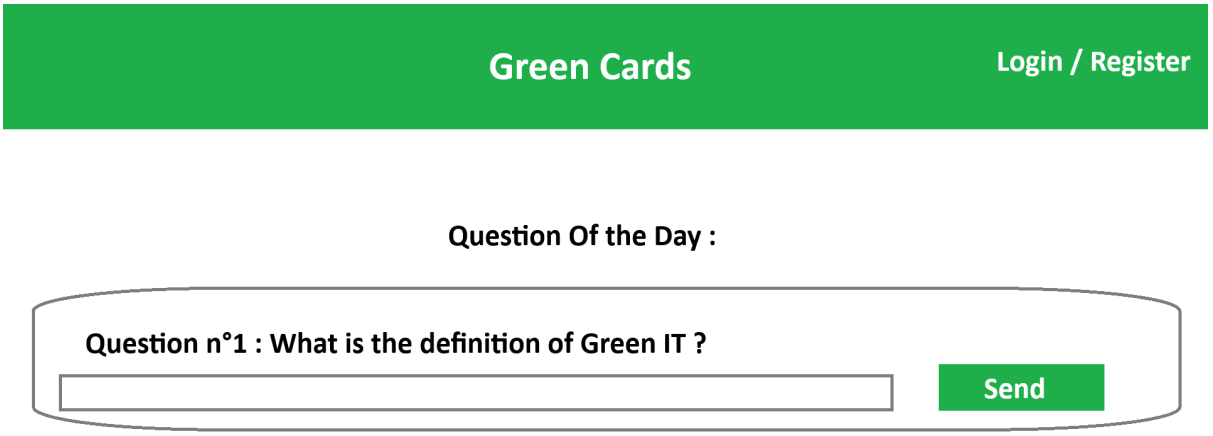
First ideas and Mockup

Our first idea was to do a random guessing game, similar to wordle or loldle. But we had a hard time figuring out how to link it to the Green IT concepts. So, the second idea we had was to make a quiz website, so that the users can answer to random selected questions about the Green IT course, and when they answer correctly, they gain a small reward (a card in their collection). All answers are available in the EFREI course material, so no need to do Google searches to find the answers ! (to reduce the environmental impact for the users)

Wireframes of the different pages

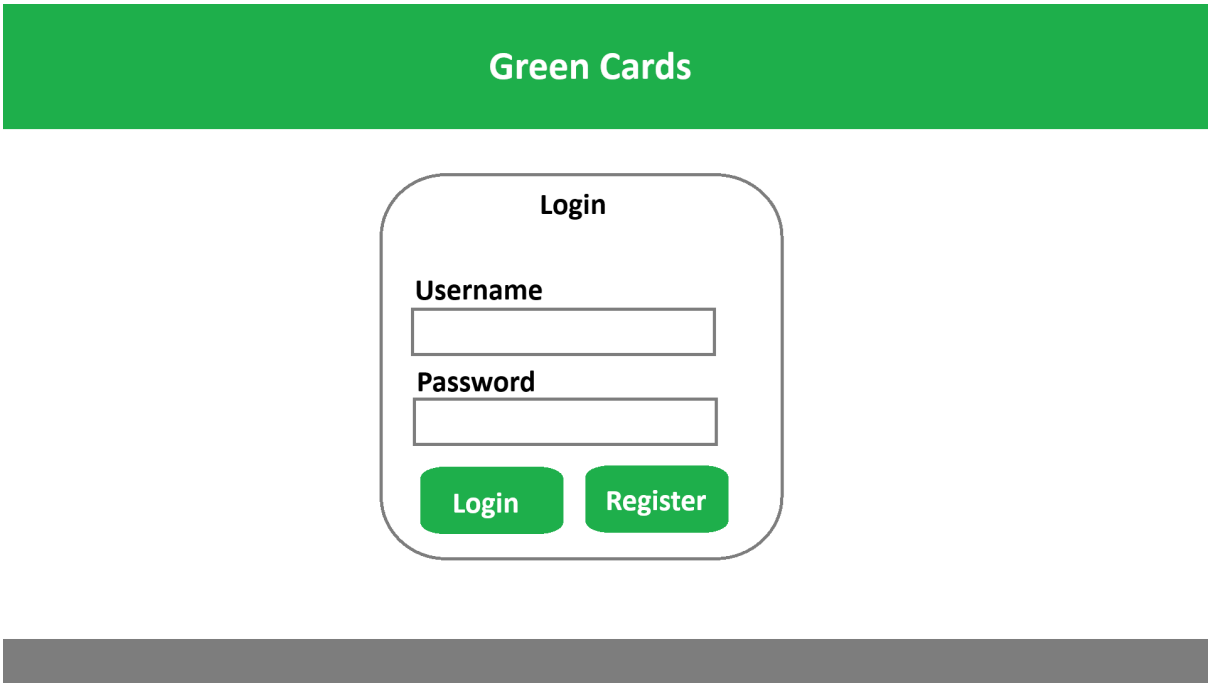
Those are the concept images we used to create our website. Please keep in mind that the final project may look different.

Home page:



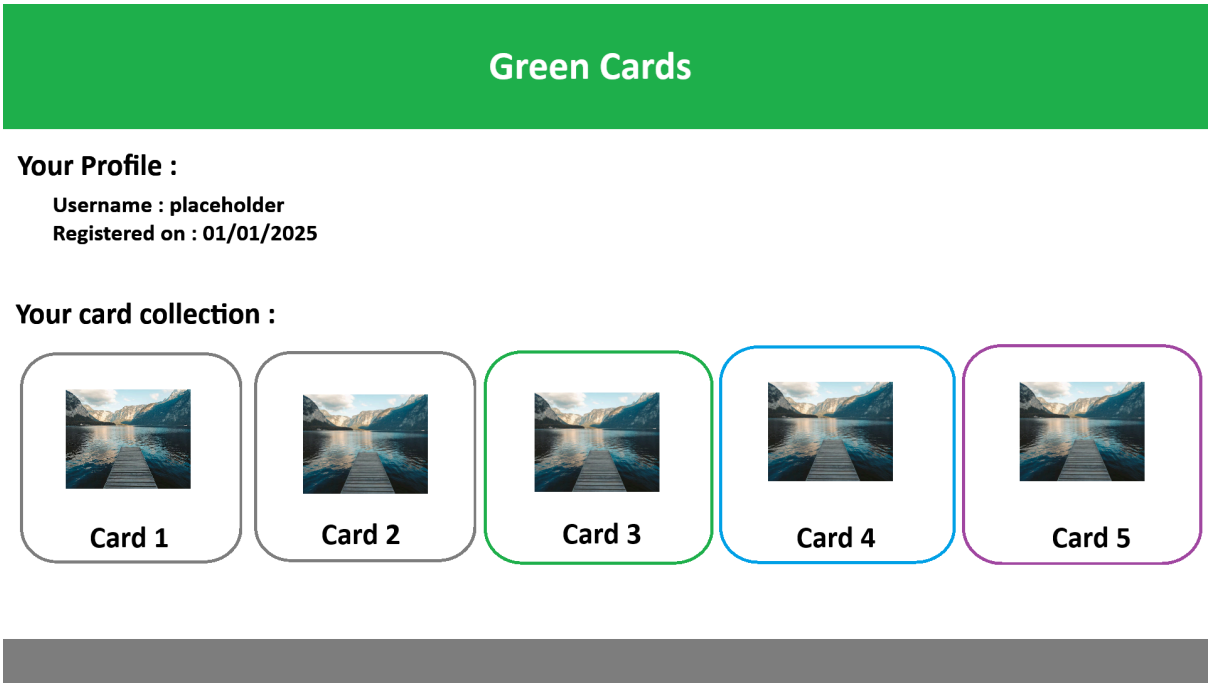
For the home page, we wanted something simple and clear : we display a question in the middle of the website, with an input field and a button to answer the questions.

Login / Register page:



For the login page, again, simple design, just a username and password field, a button to log in and a button to register instead if the user didn't create an account on the website already.

Profile page:



The profile page should show the user's information, and their card collection. We will need to optimize the images of course, and the cards will be displayed only if the user answered the questions correctly.

Part 2 - Development & Eco-Responsible approach

Explanation of the main website features

Our website, Green Cards, consists of a fun game where users can answer questions about the Green IT course to gain rewards !
Each day, there is a random question selected among the list and the user can answer it on the main page.

The user can log in (or register, if they never logged in before) to track their progression. Their progression takes the form of cards, representing funny animals, that they can collect by answering correctly. Users need a bit of luck to get the questions they are missing for their collection, but they also need to know their GreenIT course !
The users and their answers are stored in a database, whose implementation is discussed right below.

Database implementation

We are using a Mysql server which is hosted on a scaler. We hold 4 tables. One for the users, one for the cards, one for the questions and one to link the user to which cards they own. This database implementation is the simplest possible in this case as we don't need to link the questions with a date and just use today as a seed for our random question on the server side. This simple implementation also allows for fewer api routes and api calls while still preserving all of our data integrity and security.

Minimizing the environmental impact

The very first idea Anatole had was to host the whole website on his Raspberry Pi Pico, which would make the whole website run on a setup that is almost carbon free. However, as we need to respect the guidelines, we will have to host the website in a more standard manner.

We still managed to do some big optimizations to reduce our carbon footprint and minimize the environmental impact of the website:

- For image optimizations, we did two things:

Firstly, all images were saved in .webp format, which is better to reduce their impact on the website.(they are 10x smaller afterwards)
And also, we tried to put the images in lazy loading mode, but instead decided to smart load instead.

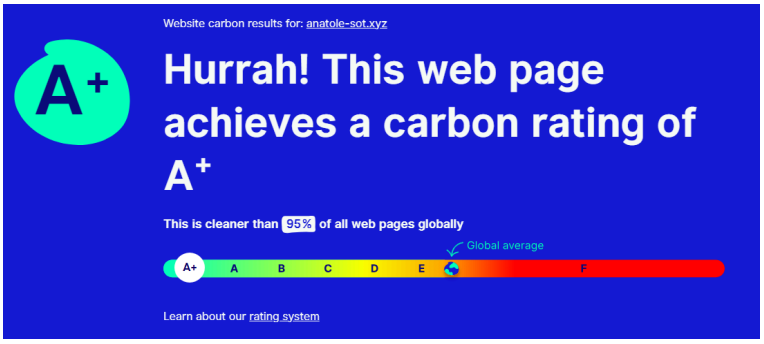
- For the hashing of the sensible data:
We used a standard algorithm which has been optimized a lot over time in order to not spend so much time crunching passwords

- For the database and server:
We are using a very scalable server and database which shares resources across many different websites allowing for both scalability and efficiency as if we don't use a resource it is allocated to someone else instead of being unused. All database calls also only happen on the server side for both security and redundancy.

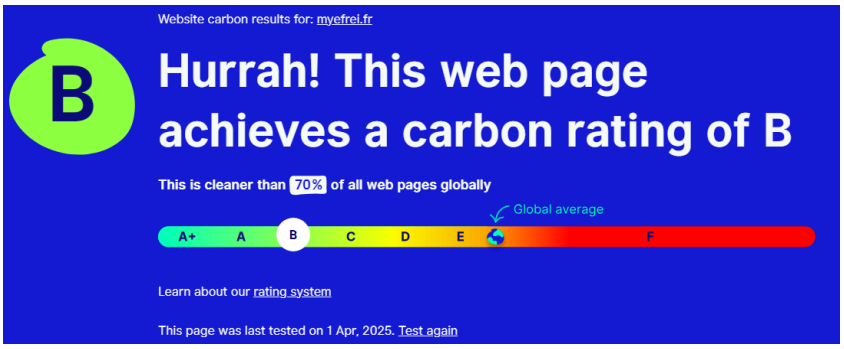
Carbon footprint analysis result

We calculated the carbon footprint of our website using different tools, like Website Carbon Calculator and EcoPing. Here are the results below :

On Website Carbon Calculator :

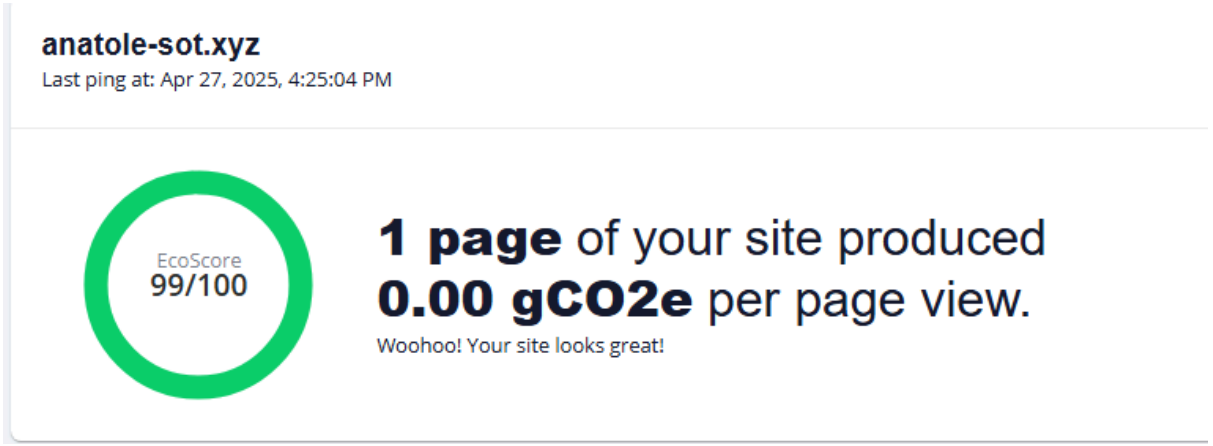


We hosted the site on Anatole's server to get the rating, and got A+.
In comparison, we tested to see the carbon rating of myefrei.fr, and it got a B.



It is not surprising to see this comparison, as the Myefrei website is not made to be optimized for its carbon footprint, and also it is way bigger overall and contains a lot more images, videos, and animations.

On EcoPing :



When testing the website and pinging from Paris, we got the following results. A score of 99/100 and 0gCO2e per page view.

Part 3 - Discussion and Conclusion

Challenges faced

The first obvious challenge that we faced was that we chose to code without an HTML / CSS framework, to obviously reduce our carbon footprint, as suggested by the course. We all learned during the 5th semester to code websites using frameworks such as React or VueJS, so going back to native HTML CSS and Javascript was a bit hard to get comfortable on.

Also, as we wanted to have illustrated cards, the second challenge was to make those as optimized as possible. We didn't realise that the images alone would be almost 90% of our website total size. At first, we had them in .png format, and it represented 1.13Mb of data, and then when we put those in .wepb it instantly reduced to 113 Kb.

Ideas for future projects

While this project is functional, it is hardly scalable due to its simplicity and our use of already existing assets. Should we want to create a bigger project dealing with Green IT's guidelines we would probably need to change our assets and make our own instead of using pre-existing ones. In the case where we want to keep our base quiz functionality this simple, we would need to add some kind of twist as this quiz format can get highly repetitive and the numbers of questions are not infinite.

Conclusion

In conclusion, this project allowed us to see how much non Green IT habits we have when coding websites and to rethink our approach. It also made us realise how much everyday websites use animations or wasteful and non-optimised images.