



Graduation Work/Thesis Intermediate Report

2025 Fall Semester

Title	BV: Blockchain Visualiser	Work (○) Thesis () Check the box
GitHub URL	https://github.com/23-jose/blockchainvisualiser	
Evaluation Grade	Advisor Modification/ Supplement List	Member List
Choose 1 among A, B, F (will be given by the advisor professor)	<input type="radio"/> <input type="radio"/> <input type="radio"/>	호세안툰스 <i>Jose Antunes</i> (sign) (Std no. : 2021313406)

2025. 09. 15

Advisor :

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Abstract: In the beginning of the 2020s decade, blockchain technologies became prominent and their use increased significantly. One of the main reasons for this phenomenon was the role of blockchains as cryptocurrencies and NFTs. With the promise of being decentralized and more transparent than traditional financial assets, blockchains quickly became an area of interest for many. However, as of 2025, the momentum of blockchain technologies has died down, due to not only the emergence of AI, but also due to high profile scandals and scams tied to them, and concerns over their environmental impact. Blockchain visualiser (BV) was proposed in March of this year as a platform that would offer its users easy access to Bitcoin and Ethereum transactions and energy consumption data in order to increase the transparency of these blockchains and raise awareness of their environmental impact. This paper is an intermediate report that seeks to explain the development process of BV so far.

1. Introduction

1. 1. Background

Blockchain technologies emerged in 2008 when Satoshi Nakamoto, whose identity is still unknown, created the first chain that eventually became Bitcoin. Blockchains took some time to take hold, but eventually became part of mainstream culture, reaching peak traction in the beginning of the 2020s decade. Even though blockchains have had many proposed applications from healthcare to online voting, mainstream awareness happened mostly due to their application to financial services such as cryptocurrencies and NFTs. This was facilitated by prominent public figures, who promoted these currencies as the future of finance due to their transparency, enabled by data being publicly available, and decentralization, since no one entity controls an entire blockchain.

Despite these promises, in recent years a lot of financial services facilitated by blockchains have been abandoned or lost their favor with the public. Recent high profile fraud cases have shown that despite blockchains' data being publicly available, finding and understanding that information is not always easy for the average user. This, combined with a lack of regulation, has created the opportunity for these technologies to be used to enable illegal

activities.

Another aspect of blockchains that contributed to their decrease in notability was their energy consumption and impact on climate change. Research on this topic has shown that these chains' energy expenditure is comparable to some countries [1]. Because of this, the use of blockchain technologies has been criticized; however, despite their decline in reputation, it is expected that blockchain use will keep growing. As such, it is imperative to identify why blockchain technologies consume so much energy, how to lower this expenditure, and improve public awareness of the environmental impact.

1. 2. Goal

With the issues previously stated in mind, it is clear that improving the transparency of blockchain transactions and the awareness of these technologies' environmental impact is necessary. Therefore, BV was proposed as a platform to address this need. BV's features can be grouped into two categories, each one addressing one of the needs stated.

The first need, to improve transparency of blockchain data, will be achieved through the easy-to-use transaction list and filters. These two features will be developed with the goal of allowing anyone to easily look up transaction data and filter through it. Even though blockchain data is publicly available, it is not always easy for the average user to access it or even understand it. BV's objective is to make this data as accessible and understandable as possible.

The second need, to improve awareness of blockchains' energy consumption and their impact on the environment, will be achieved through the features grouped into the impact section of the platform. This will include graphs showing how the energy consumption of Bitcoin and Ethereum have changed over time, as well as the metrics page, which will show how the use of these blockchains affects the spending of many resources. This will bring the energy consumption data into perspective by allowing users to view in terms of metrics they might be more familiar with (for example water consumption, CO2 emissions, etc.) how blockchains affect the environment.

Lastly, it is important to note that, due to the controversial nature of

blockchains usage, BV will not be a tool that promotes, facilitates or incentivizes users to engage with cryptocurrencies. BV's main goal is to improve users' access to information, not access to the blockchains themselves.

1. 3. Overview

BV's development is progressing in the expected timeline. Up until this point the UI design, its basic implementation and its deployment have been finalized. The project is currently in the stage where blockchain data is being added to the website, though some issues have arisen in this step of development. After this issue is solved, the impact section will be implemented, and a testing phase will be conducted. For a more detailed overview of the implementation process, please refer to section 3 of this paper.

2. Related Research

BV's main goal is to improve its users access to blockchain information, be it information relating to transactions or to these technologies' environmental impact. Although one core feature of blockchains that has become part of its identity is the public availability of transaction and other data, this does not necessarily mean that the average user knows how to find this data or even fully understands it. With this in mind, in order to keep blockchains true to their identity of transparency, BV plans to improve the access and understandability of their data.

Current technologies like Blockchain.com [2] and Etherscan.io [3] offer access to the same publicly available data but can sometimes be difficult to understand and navigate. BV stands out by being a platform that focuses on ease of use, creating a user-friendly environment where information can be easily understood. Additionally, BV plans to take a different approach to its identity as a platform. Existing platforms have been environments where blockchains are presented as interesting or easy ways to make investments and often provide users with easy access to crypto wallets or other tools that incentivize interaction and participation in the financial aspect of these technologies, essentially basing the identity of the platforms around the desirability or promotion of cryptocurrencies and similar services. Because of this there is concern that these platforms are not created with the user in mind or that the

presentation of the data could be biased. BV plans to be an environment that promotes transparency and incentivizes users to think critically before and while engaging with blockchains, making the user, not any specific blockchain, the main beneficiary of BV.

Moreover, existing platforms tend to not include energy consumption or environmental impact data which is a core feature of BV. Previous research on this matter has shown that blockchains have significant impact on the environment specifically due to their energy consumption during the mining process. Z. Xiao, et al.'s research estimates that, between 2017 and 2020, Bitcoin mining in China was responsible for 77.84 million tons of carbon dioxide emissions and predicts that this amount will increase to 76.40 million tons by 2030, and 722.18 million tons by 2060 [4]. S. Chamanara et al.'s paper urges for action to be taken to mitigate the footprint of blockchains, estimating that the Bitcoin mining network consumed more electricity than most countries, emitted the same amount of CO₂ as burning 84 billion pounds of coal or running 190 natural gas-fired power plants, consumed more water than 300 million people in rural Sub-Saharan Africa, and its land footprint was 1.4 times the area of Los Angeles [5]. Lastly, the paper referenced in the introduction of this report states that some blockchains' energy expenditure is comparable to that of entire countries, and also puts forward the idea that current estimates of this metric are being underestimated in research [1].

The research presented illustrates how blockchains have a significant impact on the environment. Considering that these are technologies that are projected to grow, addressing this issue is imperative. By improving users' access to data related to both the financial aspect and the environmental impact of blockchains, BV stands out by being a platform that promotes awareness and incentivizes responsible use of these technologies.

3. Implementation Progress

3. 1. Figma Design

The implementation of BV up until this point has followed the steps stated in the project proposal with no significant deviation from the initial plan. As such, the first step was to design the website's UI with Figma. Each of the different

pages was fully designed, a logo was created, and a yellow and dark grey color palette was chosen. The final design can be accessed via the link available on the project's GitHub repository's README.md file, or in the picture below.

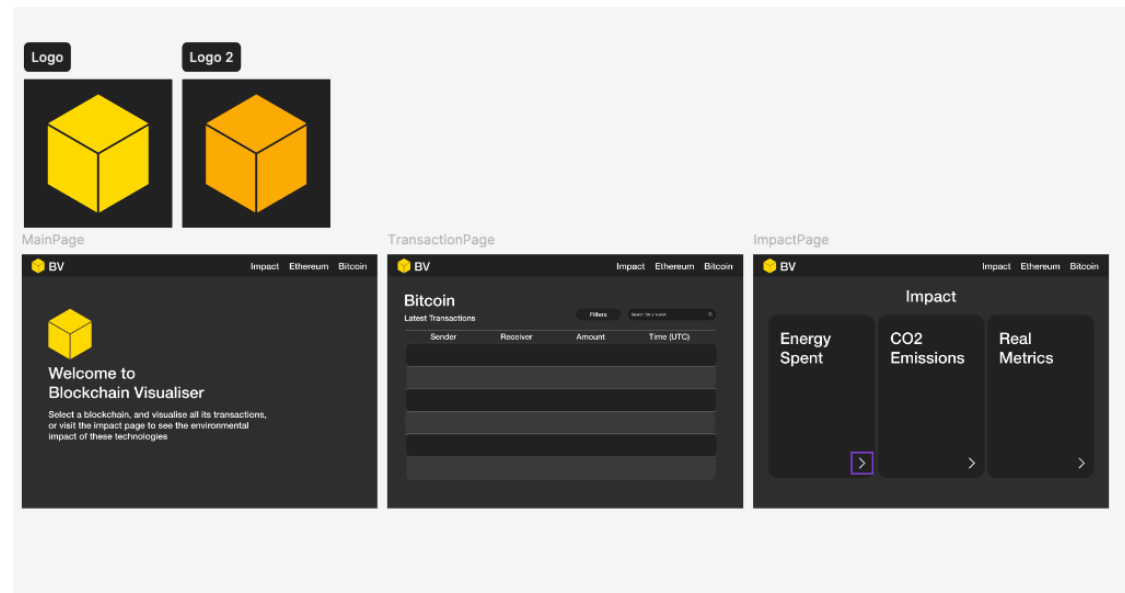


Figure 1. BV's design made with Figma

3. 2. UI Implementation

With the UI design concluded, the next step was to create the project and implement it. As stated in the proposal, the Figma design served as the guide for this implementation step, allowing for a straightforward process. The project was initialized as a Next.js application, with Tailwind CSS included. This allowed for easy implementation of the elements' styling.

An important aspect of this step was the focus on creating reusable components, which was facilitated by Next.js. All components created were stored in a components folder, which allowed them to be used in all the website's pages as needed. For example, the website's navigation bar, which is displayed at the very top of all pages, is one of these reusable components. This allowed for the same code be reused, significantly reducing implementation time, and improving code readability.

3. 3. Vercel Deployment

After UI implementation, the website was deployed using Vercel, making it accessible anywhere via an URL. With this, the first testing phase started with the main goal of testing BV on different screen sizes. Through testing it was apparent that the implementation was not suited for smaller screens, and the website was unusable on most mobile devices because of this. With this insight, the entire code was revised to improve the website's responsiveness, which was achieved mostly through Tailwind's utility classes. The UI can be accessed via the link: <https://blockchainvisualiser.vercel.app>

3. 4. PWA Implementation

One of the goals stated in the project proposal was the creation of a PWA in order to make the website accessible on mobile devices. As of this moment, this has not yet been implemented. Since responsiveness was achieved through Tailwind, it was deemed that mobile device users could already use BV without the need for a PWA since the website was already optimized for these users. PWA implementation may be done at a later stage of BV's development, but as of now it is important to focus on other aspects of development.

3. 5. Remaining Phases of Development

After UI deployment, the development process shifted towards adding blockchain data to BV. Bitcoin was chosen as the first blockchain whose data was to be implemented. The first step in this stage was to find an API that suited the needs of the project. To test different APIs, it was decided that the Transaction List component would be the first implementation of real time data, with the initial goal of simply displaying the 10 latest transactions on the list. However, the chosen free APIs: Blockchain.com [2], Blockstream.info [6], and Mempool.space [7] were very limited in the number of requests they allowed. Because of this, even though it was possible to implement this first version of the transaction list, it was difficult to test it, and it was deemed difficult to use these APIs for the remaining features of BV. This is an issue that is yet to be solved at this stage of development.

With the roadblock previously mentioned, the next steps of the project as stated in the proposal are yet to be implemented. This includes researching Bitcoin and Ethereum energy consumption data, choosing the appropriate

information to display on BV, and implementing the feature that compares energy consumption numbers to recognizable metrics like numbers of trees cut, CO2 emissions, water consumption in L, etc.

The implantation of these features would be followed by a final period of deployment and testing; and improvement of BV using testing feedback.

4. Platform Features

4. 1. HomePage

BV's home page is the user's first interaction with the platform. A simple design was chosen, and a description of the platform is displayed on this page. This allows users to easily understand the purpose and features of BV. This page also includes the navigation bar that can be used to access all other BV features.

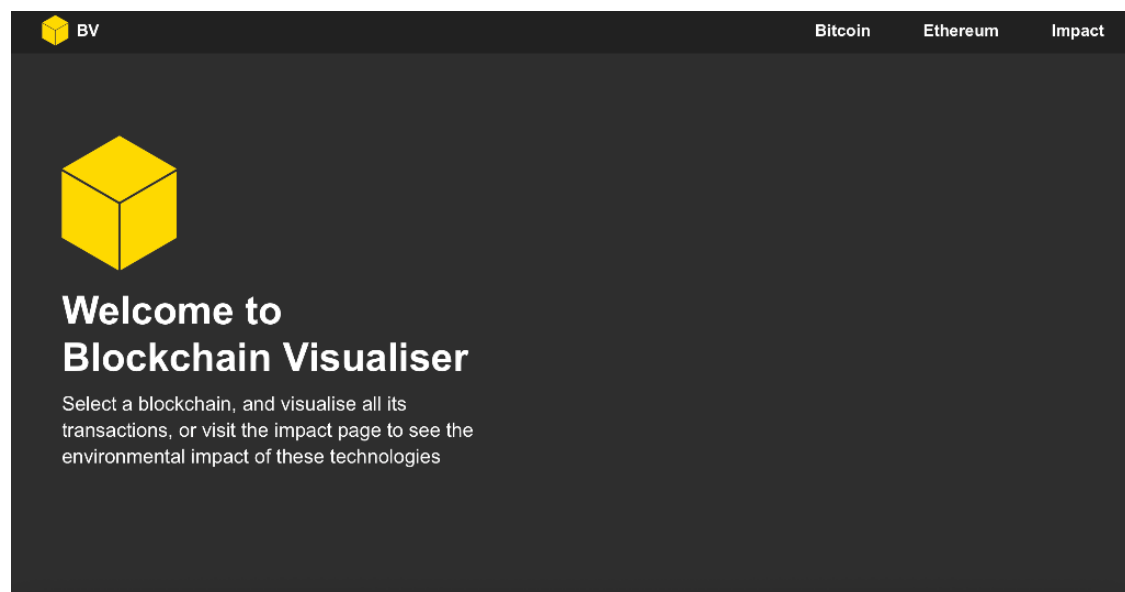


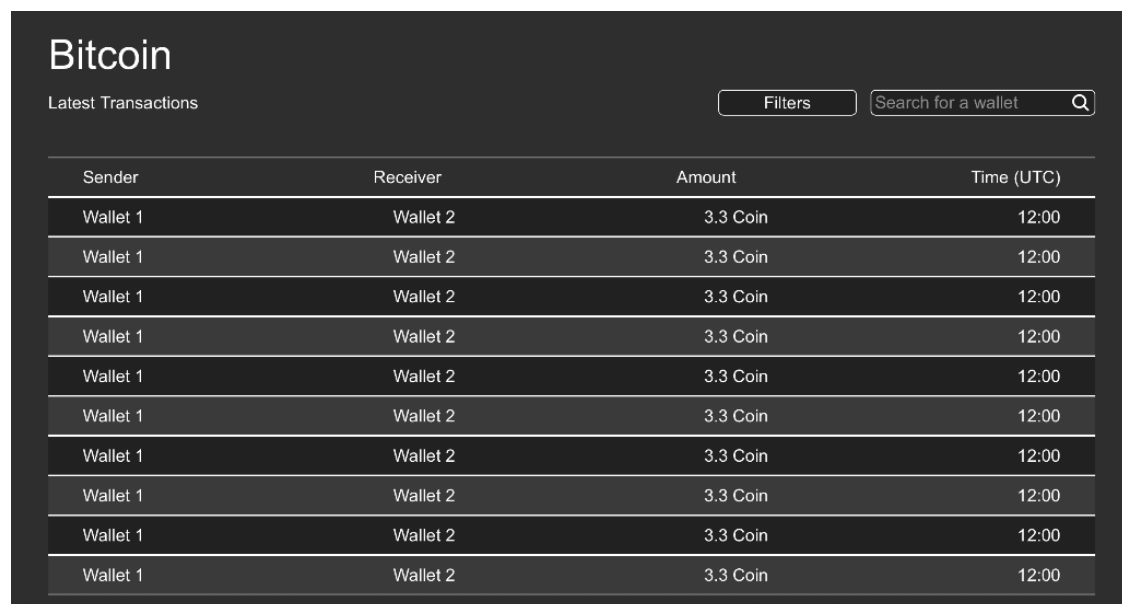
Figure 2. BV's HomePage

4. 2. Transaction List

BV will include two transaction lists, one for Bitcoin and another for Ethereum. The default state for these lists will be to show the latest transactions from each blockchain, but users can search for specific transactions by using the

filters or search bar included in the page. This feature aims to improve the transparency of these blockchains by easily providing users with access to all transaction data and a convenient way to filter through it. This will allow users to verify the transaction history of someone they are planning to exchange tokens with.

This feature will also allow anyone to monitor how public figures use these blockchains. Currently, one of the issues connected to blockchains is their use for financial scams. Usually this involves public figures leveraging their influence to promote a certain token to convince users to buy it, increasing the value of the token. Later, those public figures and those associated with them can sell their tokens and reap the value of this price increase, which causes the value of the token to quickly fall. BV aims to allow any user to check how a certain public figure has previously engaged with the blockchain in order to help determine whether they are a reliable source of financial advice. Moreover, this feature will help mitigate insider trading. Even though this is mostly an issue with stocks, it can also happen with cryptocurrencies, so BV's goal is to increase awareness of this practice.



Sender	Receiver	Amount	Time (UTC)
Wallet 1	Wallet 2	3.3 Coin	12:00
Wallet 1	Wallet 2	3.3 Coin	12:00
Wallet 1	Wallet 2	3.3 Coin	12:00
Wallet 1	Wallet 2	3.3 Coin	12:00
Wallet 1	Wallet 2	3.3 Coin	12:00
Wallet 1	Wallet 2	3.3 Coin	12:00
Wallet 1	Wallet 2	3.3 Coin	12:00
Wallet 1	Wallet 2	3.3 Coin	12:00
Wallet 1	Wallet 2	3.3 Coin	12:00
Wallet 1	Wallet 2	3.3 Coin	12:00

Figure 3. BV's transaction list for Bitcoin in its current state of development.

Since BV only features two blockchains, this feature's goal cannot be fully achieved; however, if BV's development were to continue past the timeframe of this project, development efforts would be geared towards including other

blockchains in the platform. The current version of BV serves as a first step towards this goal of transparency.

4. 3. Energy Consumption Graph

BV will also give users access to an energy consumption graph. This feature's goal is to improve awareness of blockchains' environmental impact. Similar to the previous feature, users will be able to filter the data shown in the graph, so that blockchains can be compared and trends in their energy consumption can be visualized. This will also allow users to see the efforts that different blockchains have employed overtime to mitigate their impact.

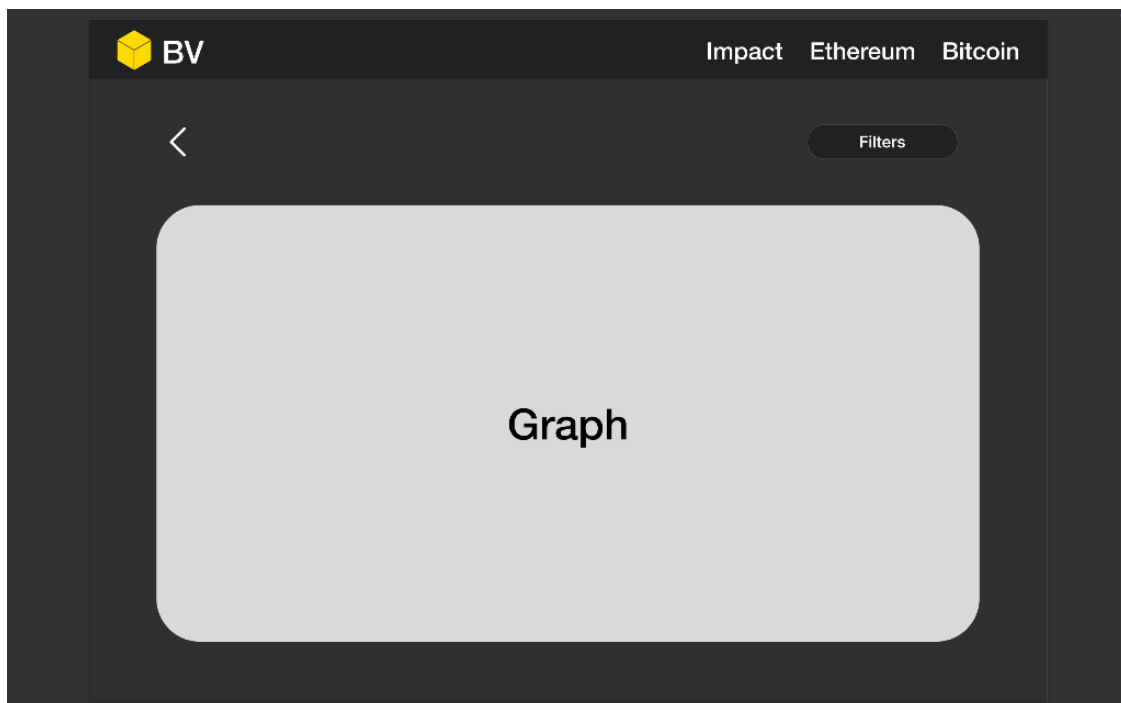


Figure 4. BV's energy consumption graph, currently not developed

4. 4. Environmental Metrics

While energy consumption is an important metric to track, it might be difficult for all users to meaningfully understand the data presented in the graph presented in the previous subsection. Because of this, to further improve users' understanding of Bitcoin and Ethereum's impact on the environment, the environmental metrics page will be created to allow users to visualize the real effect of these technologies. The goal is to translate harder to understand data (for example, energy consumption) into data that the average user can better

understand (for example, liters of water spent, number of trees cut, amounts of e-waste). With this information, the environmental impact of these technologies will be brought closer to the user by giving them data they can relate to their own life. This page will also include filters so users can compare different blockchains or time periods.

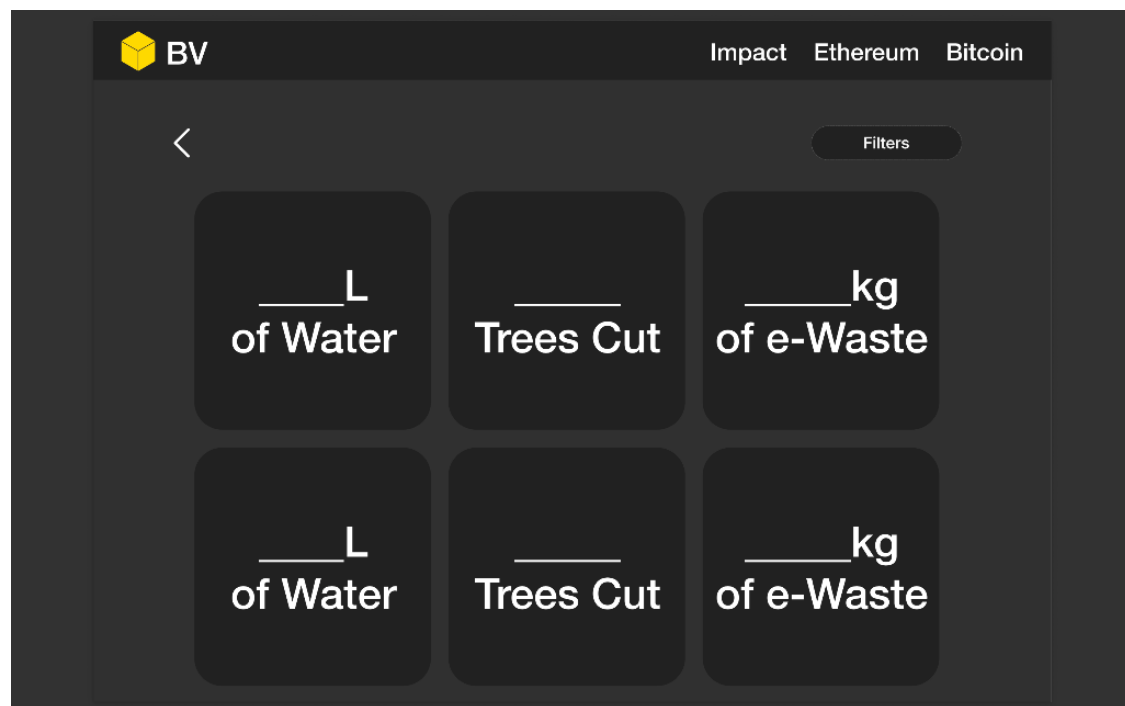


Figure 5. BV's environmental metrics page, currently in development

5. Conclusion

BV's development is mostly following the plan set out in the project proposal. Even though some issues have been met, specifically with the APIs, and PWA implementation was abandoned, the expected timeline is still being followed. The next steps of development will be to figure out a way to display the blockchain data, research energy consumption data and implement it on the impact pages of BV. It is expected that this plan will allow BV to be fully functional as a platform that helps users review Bitcoin and Ethereum transaction data, as well as a platform that easily communicates to the public the environmental impact of these technologies.

In terms of personal impact, developing BV has been challenging yet very

gratifying. It has allowed me to develop my web development skills both through designing the UI and implementing it. Using git and GitHub has also made version control more straightforward and helped me get more comfortable with these important tools. Even the issue with the APIs have been learning opportunities, both about APIs and their use in general, but also about blockchain data. It is expected that researching and implementing energy consumption data will greatly improve my research skills, and ability to select and evaluate data.

5. References

[1] A. de Vries, "Bitcoin's energy consumption is underestimated: A market dynamics approach", Energy Research & Social Science (ERSS), December 2020.

[2] Blockchain.com. <https://www.blockchain.com/en/>

[3] Etherscan. <https://etherscan.io>

[4] Z. Xiao, S. Cui, L. Xiang, P. J. Liu, H. Zhang, "The environmental cost of cryptocurrency: Assessing carbon emissions from bitcoin mining in China", Journal of Digital Economy, December 2023.

[5] S. Chamanara, S. A. Ghaffarizadeh, K. Madani, "The Environmental Footprint of Bitcoin Mining Across the Globe: Call for Urgent Action", Earth's Future, October 2023.

[6] Blockstream Explorer. <https://blockstream.info>

[7] mempool.space. <https://mempool.space>