



ENSE 805 Project report-out & lessons learned

Project: Deforestation Data Platform

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Business Need/Opportunity:

Deforestation is an increasing problem that has impacts on the environment, economy, and society. We do have tons of information about deforestation, but it is not necessarily accessible and interpretable by non-technical people, such as students or the public. Existing technologies, such as GIS, are very powerful but still need special training, so they are hard to use for many people.

The Deforestation Data Platform addresses this challenge. It utilizes Power BI to build an interactive dashboard that presents deforestation data in a user-friendly way. The platform consolidates data from different sources, including Global Forest Watch, into a repository where users can interact with deforestation trends, drivers, and effects. The website serves bridge to advanced environmental information and those who need it most. By consolidating the information and making it available in an interactive format, the website offers a tool for students, teachers, and anyone wanting to know more about deforestation. It presents an easier-to-use alternative to conventional GIS-based websites, which are less user-friendly for general users.

This app is designed to help with environmental education and awareness. It is a means by which people can interact with deforestation information, discover its causes, and visualize the actual effect. The site is more than a deforestation tracking application—it is an educational, teaching, and inspirational resource to save our forests.

This project answers the call for interactive and accessible environmental data, allowing users to understand complex issues in a meaningful and uncomplicated way.



Reflections on Project Planning

UN SDG(s) Selected and Why

The main UN SDGs selected for this project are **SDG 13: Climate Action** and **SDG 15: Life on Land**.



- **SDG 13** – It revolves around climate change and its effects. One of the direct reasons for climate change is deforestation which is generally due to the carbon dioxide emitted from the disappeared trees. It is directly related to the project objective of avoiding deforestation and its effect on the environment.
- **SDG 15** – It is dedicated to the conservation, restoration, and sustainable use of terrestrial ecosystems. Forests are a crucial component of ecosystems, so this goal directly pertains to deforestation monitoring and education, and therefore creates awareness for forest conservation.
- We have chosen these SDGs because one of the core drivers of climate change and biodiversity loss is deforestation, and our platform will make users aware of these issues to bring about actions that can be utilized to save forests and prevent their destruction.

Community Research and Requirements Gathering

- Our community research focused on understanding the needs of our primary target audience: **middle school students** and **the public**. We needed to make sure that our site would be beneficial and helpful to these users.
- Key findings from our research include:

The majority of students and the public do not have the background to decipher sophisticated environmental information. Current systems, such as GIS tools, although comprehensive, are too



technical for their use and everyday application. Students, teachers, and the public are more and more interested in learning about environmental problems, yet current tools do not offer the interaction and accessibility required. An interactive website that breaks down complicated deforestation data would bridge the gap, making trends, causes, and impacts of deforestation more accessible to the users.

The inventory of technology setup showed that the tools such as Power BI were perfect to develop a platform that was capable of managing big datasets, representing real-time data, and interactively engaging the users—a central element to bring deforestation data to non-experts.

Professional Opinion on Project Planning Processes and Documentation

- The planning processes and documentation provided in the course were helpful in providing a structured approach to the project. The steps allowed us to define key aspects such as:
 - The SDGs we would focus on, ensuring alignment with global environmental goals.
 - Insights into the needs of students and the public, which guided the platform's development.
 - Selection of appropriate tools like Power BI, ensuring that the platform would meet the accessibility and interactivity needs of our target users.

Assumptions Made and Constraints Uncovered:

Assumptions:

- We assumed that middle school students and the public would benefit from an interactive platform that simplifies complex deforestation data.
- We assumed that Power BI would be intuitive enough for non-experts to interact with and that it could handle large, complex datasets from sources like Global Forest Watch.
- We assumed the data from GFW would remain regularly updated and accurate enough to present real-time deforestation trends.



Constraints:

- The datasets provided by Global Forest Watch are rich but require significant transformation and cleaning to make them user-friendly.
- Though Power BI is easily available, to realize its true potential, one needs to understand features such as slicers, drill-through, and filtering, which may prove difficult for mere non-professionals to utilize fully without proper guidance.
- The platform had to manage large data sets well without hindering performance, and so the Power BI model had to be optimized to deliver a seamless user experience.

Technology Stack Selection

- **Initial Technology Stack:**
 - **Power BI** was selected for dynamic visualizations and ease of use, making it ideal for non-experts.
 - **Excel** and **Power Query** were used for data cleaning and transformation.
 - Publicly available deforestation datasets from **Global Forest Watch (GFW)** and **FAO** were chosen for reliable, up-to-date data.
- **Evolution of Technology Stack:**
 - As the project progressed, we integrated **DAX** for custom calculations and improved data aggregation.
 - Adjusted the data model to better integrate multiple datasets, enhancing filtering and platform responsiveness.
 - Added advanced features like slicers and drill-through for deeper user engagement.

Drafted Prototypes and Minimum Viable Products (MVPs)

- **Prototypes:**

Initial prototypes revealed basic charts and trends to test layout and presentation strategy. Feedback required adding interactivity features like filters, tooltips, and drill-through.

- **Minimum Viable Product (MVP):**

The MVP emphasized the main facts regarding tree cover loss, deforestation drivers, and country comparisons. The users could filter by regions and time periods in order to analyze the data.

- **Evolution of MVP:**

Rich with interactive features such as tooltips and information cards for presenting additional context. More interactivity, allowing filtering by multiple attributes and showing more detailed information. Simplified the interface for easier navigation.

Reflections on Project Results

What We Created

Deforestation Data Platform is an interactive Power BI-powered dashboard that consolidates deforestation data from reputable sources like Global Forest Watch (GFW) and FAO. It is designed to simplify challenging environmental data to make it available to all, including students, so they and the public can easily navigate deforestation trends, the causes and effects. Key highlights of the platform are interactive maps, filters, and dynamic visualizations enabling the users to assess data on global tree cover loss, drivers of deforestation, and regional comparison.

Key images/screenshots illustrating the core functionality:

- **Main Dashboard:** Displaying global deforestation trends with interactive maps and charts for tree cover loss over time.





The Reality of Our Forests

Forests cover **31% of Earth**, but we're **losing them faster** than ever! *What's causing this?* Tap below to explore some Facts!



"Now that you know forests are disappearing, what do you want to learn next?
Click below to explore the facts!"



See Where Deforestation is
Happening



What Causes Deforestation?

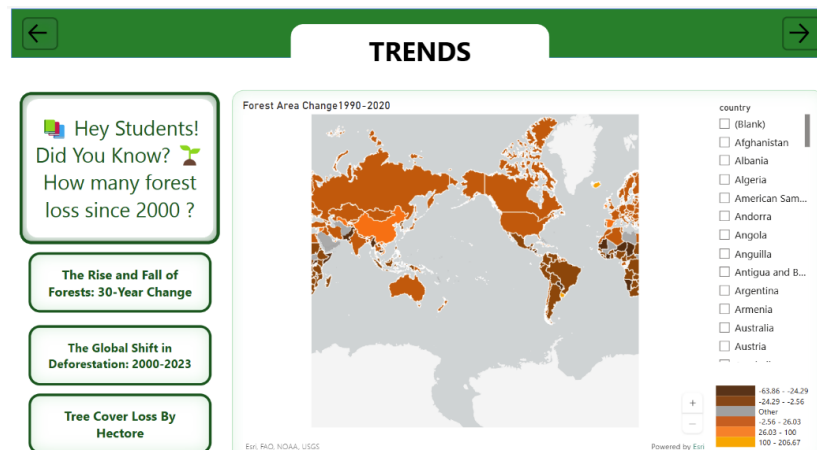
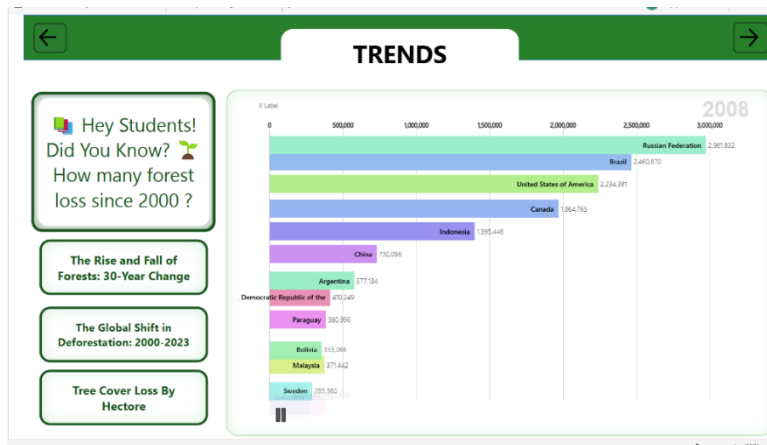


Can We save Our Forest?

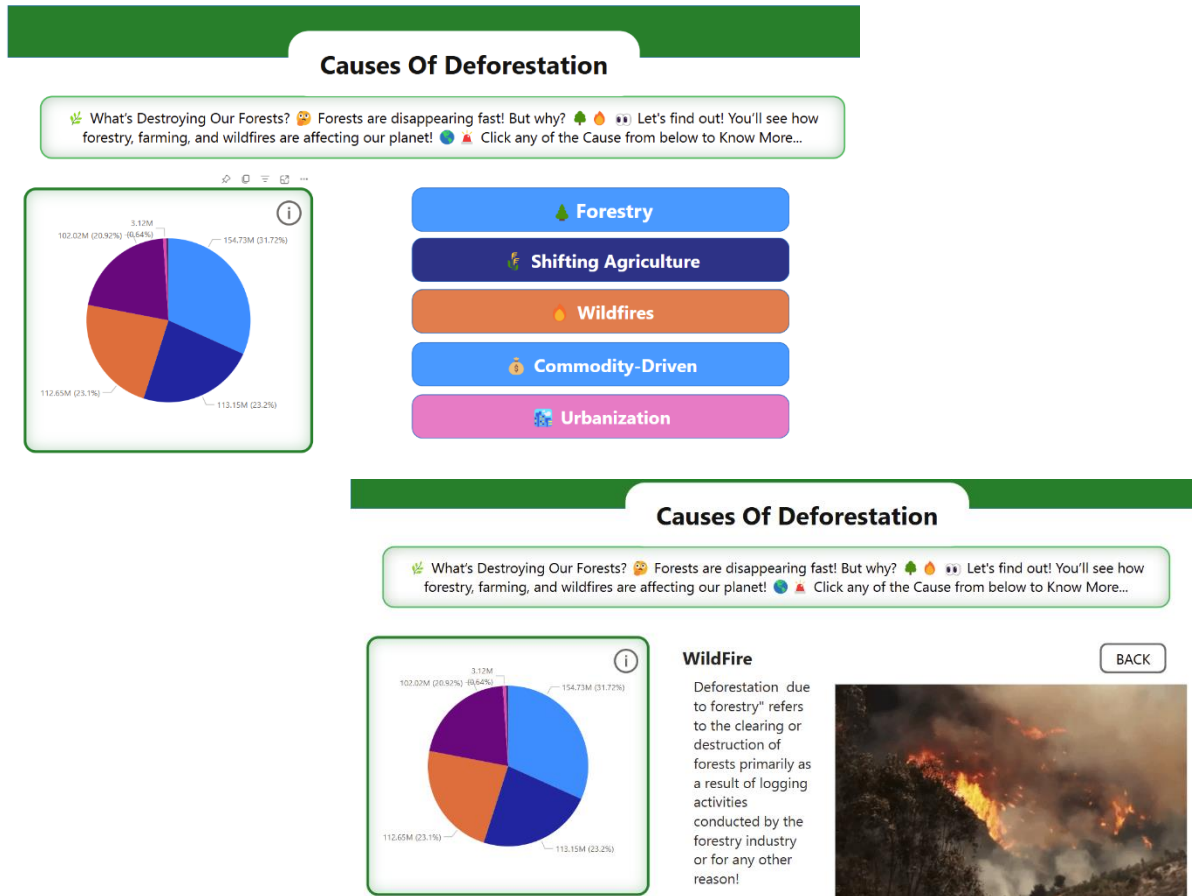


Learn More About Trees

- **Regional Comparison Tool:** Interactive map allowing users to compare deforestation trends across different regions.



- **Deforestation Drivers:** Visual representation of causes such as logging, agriculture, and urbanization, with data filters for deeper insights.



Review of the Initial “Planning and Initialization” Video

We talked in the initial video about what we envision the platform to look like: taking complex deforestation data and explaining it in terms that are clearly comprehensible and available to students and the public alike. We envisioned creating a seamless research vehicle for global trends of deforestation with real-time interactive functionality so that users are able to evaluate the data at the time.

Initially, we thought of a quite bland tool with static charts, but as things progressed, we realized just how important interactivity would be in order to enhance engagement. Introducing filters, slicers, and drill-throughs was an enhancement that added depth on the platform, leading us further along the line to what we had originally envisioned—a more interactive and immersive experience.



Software Design Activities and Findings

The platform design was largely decreed by accessibility and interaction that were at the core of our objectives. The first design was simplicity-driven and clarity-focused to ensure that the information itself presented in a self-explanatory manner. Thereafter, foremost in our considerations in designing were:

- **User Interface (UI):** We preferred a clean, minimalistic layout so as not to overwhelm the users with too much information at once. The interface was designed with a number of sections representing different aspects of deforestation, i.e., trends, causes, and solutions.
- **Data Interactivity:** In moving from static graphs to more interactive graphs, we recognized the necessity to allow users to interact with data. This required the deployment of interactive features such as slicers by time and region, and drill-through in order to examine more detailed observations.
- **Data Model:** There were various datasets that had been imported, and this was one of the areas of focus. We had to ensure the data model would enable flexible filtering and consistency of the data across regions and time periods. This involved meticulous handling of large datasets and using Power Query for data transformation and cleansing.

These design ideas were closely associated with the user-centered design class lectures, data visualization best practices, and the need for interactivity in learning platforms. Feedback from users during the development process helped us even more to polish the design so that the platform was not only functional but also interactive.

Project Experience

- **What Went Well:**
 - **Interactive Features:** The most successful part of the project was the addition of interactive features. To be able to drill down to the individual insights, compare regions, and filter out the data made the system highly usable.



- **Usability Testing:** Initial testing with our audience (students and the public at large) guided areas for improvement for us. How simple it was to use and provide feedback on the site was fine, and our design choices were affirmed.
- **Data Integration:** Having a number of datasets successfully integrated and ensuring that they coexisted well with one another was a major success. The platform now gives the user a clear image of deforestation patterns around the world, and thus it is an invaluable resource for environmental education.
- **What Didn't Go Well:**
 - **Performance Issues:** Performance was the first issue due to the large volume of data. The page was taking time to load, especially when the users applied multiple filters at the same time. This issue was addressed by optimizing the data model and applying aggregations on the data sets.
 - **User Understanding:** While the platform was designed to be intuitive, more effort could have been devoted in simplifying the explanations and providing more learning context within the platform.
- **What Would We Do the Same in Future Projects?**
 - **Iterative Testing:** The repeated cycle of developing the platform, listening to user feedback, and refining was worth it. In future projects, we would do the same thing in order to ensure that the end product is what users require.
 - **Focus on Usability:** Putting focus on creating an easy-to-use, accessible platform for beginners paid off. For future projects, we would maintain that focus so the technology doesn't overwhelm the user.
- **What Would We Do Differently in Future Projects?**
 - **Enhanced Educational Content:** Looking back, we might have incorporated more educational content into the platform, including concise definitions of key terms, effects of deforestation, and solutions. This would have assisted users, particularly students, in understanding the context of the data better.



- **Scalability:** For future projects, we would look to scale the platform so that it can handle larger datasets and offer more real-time data. We would also look to include predictive analytics or machine learning to offer projections on deforestation trends.

Opportunities and Design Ideas for Future Work

Looking ahead, there are several opportunities for enhancing the platform:

- **More Interactive Features:** We can include more interactive features, such as quizzes or games, to engage students further. These would test their deforestation knowledge, reasons, and consequences and make the platform more educational.
- **Integration of Predictive Analytics:** Use of machine learning algorithms to predict future patterns of deforestation would make the platform more useful to researchers and policymakers.
- **Mobile Optimization:** With the increasing use of cell phones, having the platform mobile-friendly would make the platform more accessible and usable.
- **Expanded Data Sources:** Adding more datasets on forest conservation efforts, reforestation efforts, and deforestation prevention strategies would provide more information on the issue to the users.

General Reflections on the Class & Project Experience

Before Taking ENSE 805, Were You Aware of the UN SDGs?

We didn't know the United Nations Sustainable Development Goals (SDGs) before taking this course. Although we knew some about the world problems like climate change, poverty, and education, we never studied these problems as SDGs. Through this course, we learned that the SDGs are a very important plan to solve international issues and how engineers are also duty-bound to ensure that these goals come true through the technology they develop. This has allowed us to understand how our engineering can help make the world sustainable and equitable.



Typically, Before Taking This Class, When You Engineered Software Solutions, Were You Concerned with Areas Encompassing the UN SDGs?

We did not so much concern ourselves with the SDGs when we were engineering software solutions before this class. We were more concerned with technical issues, such as meeting deadlines, creating functional systems, and ensuring that the software was meeting the expectations of the client. We had a sense of moral principles, but we weren't thinking about how our projects would contribute directly to global challenges like climate action or education. But reflect on some of our past projects, and we can see they would have indirectly contributed to the SDGs:

- **Example:** One of the projects we undertook was creating an education app, which helped achieve SDG 4 (Quality Education) because it was meant to improve learning outcomes.

While we didn't focus on the SDGs explicitly, our projects could have contributed to these goals in meaningful ways.

Did Learning About the UN SDGs Help You Understand Better Your Role and Responsibility as Engineers to Society?

Yes, studying the SDGs has totally changed our way of thinking about our role as engineers. We used to believe that our role is more to solve technical problems and serve the needs of the clients. But now we know that engineering can do good for society in much broader ways. Engineers are able to solve the world's global problems through developing technology that not only addresses the technical challenge but also social, environmental, and economic sustainability.

For example, if we consider taking a glimpse at the Deforestation Data Platform, we already have the aspect of having an instant impact on SDG 15 (Life on Land) by just doing it. With its provision of deforestation data to students and the public, the platform is actually promoting environmental awareness and actions. That became apparent and so we worked harder on looking into the overall picture of what we are doing because we want to keep employing engineering solutions on this type of global problem.

What Was Your Experience in Engineering Your Specific Software Solution to Address the UN SDG(s) Selected?



Project development for the Deforestation Data Platform was an eye-opener since it opened the door to directly address one of the SDGs—SDG 15 (Life on Land)—through our software. Our platform aggregates and presents deforestation data in a readily comprehensible format for middle school students and the public, raising their awareness of deforestation and enabling them to make informed decisions.

This project also gave us experiential learning about how software can be developed to educate and encourage users on pressing world issues. It once again reinforced the fact that engineers don't necessarily need to just do technical projects but also consider the greater picture their work could bring about. By creating a tool that makes environmental information easier to read, we facilitated making environmental literacy come and allow users to take action against loss of forests.

What Was Your Experience in Engineering Your Specific Software Solution to Address the UN SDG(s) Selected?

Developing the Deforestation Data Platform was a fulfilling and educational process. We began by simplifying complex deforestation data, which immediately helped contribute to SDG 15 (Life on Land). As we went along, we needed to think about how to best visualize the data and how to display it in an easily accessible and understandable format for a non-technical user, high school students. This mindset made us simplify and display the data in interactive visualization that would engage and captivate users in learning.

- The challenge was ensuring that the software was both functional and engaging.
- We had to focus on clarity in communication and the importance of social impact in software development.

As a Future Engineer, What Are Your Thoughts on the UN SDGs as a Whole? Do You Think They Can Help or Hinder Our Work as Software Engineers?

As future engineers, we are taught that the UN SDGs are a good guide to help us inform our work. They make our projects relevant to worldwide goals and ensure they are tackling major issues. In no way does the SDG limit our work; the SDGs really provide us with a very clear picture of where technology can contribute that counts and endures. For our project, SDG 15 (Life on Land), the SDGs



enabled us to direct our work toward a project that affects a real-world issue, which is deforestation. Rather than being limiting, the SDGs ground us on what matters and challenge us to innovate in ways that are helpful to society and the world.

Should We Use the UN SDGs to Guide Our Work or Is Our Work Dependent on Customer Requests, Regardless of the UN SDGs?

While the customers' requirements are germane, we believe that the UN SDGs should be given significant consideration in our work as engineers. In most cases, especially in environmental applications, it would be possible to align the software solutions to the SDGs even if specifically not requested by the customer. Alignment with SDGs implies we address bigger issues of society and the environment and create products that contribute back.

The SDGs provide a handy compass to ensure projects remain relevant to global issues, including climate change and deforestation. Keeping the SDGs in mind, we can direct our projects towards a direction that meets real-world problems and customer satisfaction.

Will You Use Your Understanding of the UN SDGs in Engineering Solutions in the Future?

Yes, we will be applying our knowledge of the UN SDGs to engineering solutions in the future. This project has taught us the value of software solutions being truly significant when combined with global goals. As engineers, we are fortunate and obligated to create tools that can be a part of positive environmental, social, and economic impacts. In the years to come, we will always have the SDGs in mind when considering and creating our projects so that our solutions reach further. Whether doing work on climate change, education, or other issues affecting the world, the SDGs will be a vital reference point in guiding our work.

Will Your Experience Learning About the UN SDGs Inform Your Career Path Decisions in the Future?

Yes, this experience has influenced our career path options. We were more interested in the technical aspect of software development before taking this course. But through studying the SDGs, we are now conscious of how engineers can be brought into addressing global issues.



Now we are increasingly seeing the value of combining technical excellence and socially accountable practice. In the short run, we will seek challenges where we apply our engineering skills to create work in support of the SDGs that contributes to a positive effect for society.

Provide Any Other Comments on the Project

This project has been amazing and has taught us a lot about how technology can be utilized to tackle world problems. It has been eye-opening to learn that being an engineer is not just about developing working software; it's about thinking of how our work does good for society and the world at large.

- The Deforestation Data Platform has deepened our understanding of how technology can be applied to address critical issues such as environmental conservation.
- This project has inspired us to continue exploring solutions that can make a tangible impact on the world, aligning with the SDGs.