

Project Prototype-2

AHL2100/DTI6304/ENG3100 - STEAM Design

SDG-13 Climate Action

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Chosen Concept:

The concept of this design is to educate our audience about the real effects of mass-deforestation and increasing CO2 levels, focusing on deforestation in India. We want to inform the audience about how to properly conserve forest and greenland in order to better the condition of the planet, as well as ensure good living conditions for all people.

Theme:

The concept of this design is to educate our audience about the real effects of mass-deforestation and increasing CO2 levels, focusing on deforestation in India. We want to inform the audience about how to properly conserve forest and greenland in order to better the condition of the planet, as well as ensure good living conditions for all people.

Story:

The story is about a young boy called Amit who grew up hearing stories from his grandmother about beautiful nature and wildlife. As a creative and curious child, Amit would picture the world as he was narrated by his grandmother and the very next day, he would go out to see how things looked like in reality. Amit would have a tough time believing his grandmother's stories because the world that he would look at, was completely different.

He would wonder how the world has changed and there is no more greenery left around his area.

After seeing the reality, Amit would share this with his friends and teachers in school. He would also tell everyone what climate change is and how it is affecting our world. Amit takes the initiative to organise a tree planting movement for Earth Day celebration in school. This movement is also extended to the world environment day and the school's annual day.

With this small step, Amit showed how a small step made a major difference in changing a barren land to a more green area.

Identification of Datasets

Dataset A:

About: This data shows the state-wise restoration opportunities atlas of India's forest and landscape (Protection, Wide-scale Restoration, Mosaic Restoration, Excluded Area) with additional information (States' Share in the Compensatory Afforestation Fund, Allocation Under MGNREGA, Allocation of Public Finance to States Excluding MGNREGA, Actors Involved in Implementing Forest Protection and Landscape Restoration, Forest Protection and Landscape Restoration, Potential for Increase in Above-ground Carbon Sequestration, Potential for Increase in Forest and Tree Cover).

Data Creation Range: the different data shown are in between 2000 and 2018 plus some estimations for 2040 (the diversity of the data shown is the reason why we can't have a specific data creation range).

Created By: the data about the restoration opportunities is from Esri, HERE, Garmin, FAO, NOAA, USGS | Based off NaturalEarthData.com

Source (Link): http://india.restorationatlas.org/atlas

Dataset B:

About: this article shows India's Commitments to Increase Tree and Forest Cover and the consequences for Water Supply and Agriculture Production within the Central Indian Highlands (Materials and Methods, Results, Discussions, Conclusions, Author Contributions, Funding, Institutional Review Board Statement, Informed Consent Statement, Data Availability Statement, Acknowledgments, Conflicts of Interest).

Data Creation Range: the article was received on 8 January 2021, revised on 7 March 2021, accepted on 18 March 2021 and published on 31 March 2021. The data are not publicly available due to size and software required to ready the data. Thus, the data and software presented in this study are available on request from the corresponding author and we can't give an appropriate data creation range.

Created By: the informations showed in the article are from the Department of Ecology, Evolution and Environmental Biology, Columbia University, New York, NY 10027, USA, Suri Sehgal Centre for Biodiversity and Conservation, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Sriramapura, Jakkur Post, Bangalore 560 064, India.

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Water 2021, *13*(7), 959; <u>https://doi.org/10.3390/w13070959</u> (This article belongs to the Special Issue <u>Tradeoffs among Food Production, Forests, and</u> <u>Water Resources in Tropical Agricultural Frontiers</u>)

Source (Link): https://www.mdpi.com/2073-4441/13/7/959/htm

Dataset C:

About: This data shows the carbon Dioxide Emission in India (from 1960-2018). The CO2 emissions are those which are caused by the burning of fossil fuels, as well as the production of cement. Note: the line graph format shows the years and amount (in kilotons), whereas the bar graph shows the CO2 emissions in kilotons only.

Data Creation Range: 1960-2018

Created By: Data that is up to 1990 is from the following sources: Environmental Sciences Division, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, Tennessee, United States.

Content (format): The data showing the CO2 emissions is presented in various graphical formats (such as: bar graphs, line graphs and a map). By looking at the graph, we can see that this data can be used to make inferences as to how India's future CO2 emissions will look like. In this case, the CO2 emissions in India have been increasing each year, so we

can make the assumption that India's CO2 emissions will steadily increase within the next few years.

Use Cases: This would be a good dataset to use incase we wanted to know how the CO2 emissions have changed over time in India.

Source (Link):

https://data.worldbank.org/indicator/EN.ATM.CO2E.KT?end=2018&locations=I N&start=1960&view=chart

Dataset D:

About: This data shows the deforestation statistics for India (from 2001 to 2020) and some additional information. There is India's demographic data (in 2022), land cover and land use change data (Tree cover extent and primary forest extent from 2001 to 2020 in hectare and as % of previous cover and land area) and annual forest and tree cover data (Tropical primary forest loss and tree cover loss by year *30% tree cover threshold; all figures in hectares* from 2001 to 2020).

Data Creation Range: 2001-2020

Created By: Data about tree cover loss is from the following source: Hansen/UMD/Google/USGS/NASA via <u>Global Forest Watch</u>. while data about administrative boundaries is from the following source: Global Administrative Areas database (GADM), version 3.6

Content (format): The data showing the deforestation statistics in India is presented with demographic information, land cover and use change data, a list with the annual forest and tree cover data and 4 statistical tables. By looking at the tables, we can see the primary forest loss and tree cover loss by year at different subnational administrative levels within periods of 5 years and therefore have an idea of India's future land situation in the next few years.

Use Cases: This is a good dataset to use to know the evolution of the situation concerning deforestation in India over the years.

Source (Link):

https://rainforests.mongabay.com/deforestation/archive/India.htm

Dataset E:

About: This article examines the consequences of deforestation in India, as well as sustainable solutions to the climate impact. One of the data sets in the article examines the forest cover and forest cover change percentage in India from 1987-2017.

Created by: <u>https://fsi.nic.in/introduction?pgID=introduction</u>

Content by: Forest Degradation Around the World,

Content: A bar graph with 30 values spanning from 1987-2017 noting the forest cover percentage, with a line graph overlaid reporting the forest cover change percentage over the same time span.

Use Cases: The graphical representation of the forest cover percentage in India shows how human activities such as deforestation contribute to the loss of forest cover, as well as shows the slight rise as forest conservation efforts have begun to be employed.

Source: https://www.intechopen.com/chapters/66710

Dataset F:

About: This series of datasets, visualized by interactive charts and maps, focus on the changes over time in India forest cover, climate and forest composition, and forest fires. It is produced by the Global Forest Watch an open source web application that monitors global forests in near-real time and provides data and tools for organizations and institutions to do the same

Data Creation Range: Early 2000's - Late 2010's

Created by: https://www.globalforestwatch.org/about/

Content: <u>Format</u>: The datasets of each individual maps/charts can be downloaded as csv files and will give out datas on

- year,
- forest hectares,
- canopy density,
- plantation categories
- land category, etc...

For this project we will focus on the tree coverage dataset (<u>https://gfw.global/3vsdMSx</u>), and the FAO's 2015 forest cover in India dataset (<u>https://gfw.global/3C6scZM</u>)

Source: https://www.globalforestwatch.org/dashboards/country/IND/

Analysis of Datasets

Dataset A:

Content (format): the data for the restoration opportunities in India is presented as a map of India divided by states with a legend showing how to read it and, at the left side, a way to see the map's informations as a data tables, as texts and as graphs depending on the state chosen on the map.

Use Cases: This is good data to use to know the evolution of the situation concerning state-wise reforestation in India.

Dataset B:

Content (format): in this article, the data about India's Commitments to Increase Tree and Forest Cover and the consequences for Water Supply and Agriculture Production within the Central Indian Highlands is shown by a map of Central Indian highlands with the five major basins delineated (Forest cover is shown in green while agriculture is in yellow derived from the European Space Agency (ESA) Land Cover 2010 data reclassified. The inset map shows the sampling area for infiltration tests and the final sampled locations. The color of the sample locations represents the land cover), a table about Basin area and forest cover from ESA Climate Change Initiative 300 m Land Cover Data (CCI) land cover data, a table with Input data of the modified SPHY model used to simulate the differences in hydrology for forest cover ranging from 2% to 75% in the Central Indian Highlands, a graph showing observed versus daily simulated discharge for the three river basins with available discharge data for the study period, a table about the result of the particle swarm optimization (Each of the three basins was optimized individually using the Nash-Sutcliffe efficiency index as the objective function computed from daily simulations of basin discharge) and graphs of basin hydrological flux changes over the range of forest cover from 2% to 75% (Evapotranspiration A shows a linear increase as forest cover increases while the basin mean pathway to increase forest cover **B** shows a complex curved relationship of groundwater recharge with increased forest cover. All basins have maximum groundwater recharge near to the current forest cover. Graphs show groundwater recharge for the groundwater recharge optimized pathway. The optimized pathway demonstrates that it is possible to achieve increases to groundwater recharge with increased forest cover at the basin scale depending on the land converted to forest).

Use Cases: This article and its data are good for a better understanding of India's situation concerning the increase of tree and forest cover.





From the graph above, we can clearly see that the carbon dioxide emissions within India are increasing each year. Because of this past data, it is safe to say that the emissions will continue to increase in the country. The increase in emissions could be due to the fact that the country is greatly dependent on coal, as well as oil. For instance, during 2017 76% of India's electricity was due to coal [1]. India's population is also one of the largest in the world, and that can also mean that they would require more coal in order to provide electricity for the growing population.

Dataset D:



The line graph above shows the total loss of forest area in hectares from the year 2002-2020.



Sum of Tree loss in Hectares

Year 💌

The bar graph above shows the total tree loss in hectares from the year 2002-2020.





The graph above shows the types of disturbances caused in forests and their occurrence percentage which leads to forest loss.



Dataset F:

From the bar graph we see that there is an effort by the government to reforest some regions of India but that effort is not legal in all of India's regions. I know from the hindsight of our research that in later years those percentage will increase as the Joint Forest Management policy will pick steam in 2015 but there isn't data on the policy global result as of 2022.

A graph of the result in India's afforestation plan can be found here: https://ourworldindata.org/grapher/annual-forest-expansion?tab=chart&country=~IND

Second Visualization Prototype

1. Listening to grandma's stories



The best part of Amit's days was to listen to grandma's bedtime stories. In the story, grandma would tell him about the world during her time when she was young.

2. Grandma's world



According to Amit's grandmother, she would visit the villages nearby and there were beautiful green forests, green lands everywhere. Cows and horses grazing in endless fields.

3. What Amit sees in reality



Out of curiosity, Amit would go out to see the village, but he would not see any trees because they have been cut down.



The green fields that grandma talked about aren't there anymore. They have been replaced by smoky factories.

4. Then VS Now



5. Creative visualizations:

1.



2. To be done in procreate(pending)



Tools (to develop the prototype)

One of the tools which was used to create the prototype was called Procreate. To provide some background, procreate is an app which is used by professionals and hobbyists to create digital art.

In addition to the Procreate app, we needed to use a stylus in order to create drawings on the iPad. Using a stylus would be easier to create digital drawings, as it resembles a handheld tool (such as a pencil or pen). Using your fingers to draw would be very inaccurate.

Missing Elements (needed for Final Prototype)

The part of the project which is still in development is the "action" part of the story. More specifically, the images where the main character, Amit, is at school where he shares with the rest of the class what he experienced and what climate change really is. He also takes the initiative to propose a mass tree plantation movement where the children from school and people of the community plant trees on Earth Day, Environment Day and on the annual event day of the school. It would show how small steps towards environment conservation would go a long way for the generations to come.

Project Plan (Updated)

We use Trello to keep track of the tasks for each deliverable. Link to Trello board: <u>https://trello.com/b/T4ovEmT8/sdg13-climate-change</u>

