Literature Review on Storing and Analyzing Data on the Impact of Climate Change

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1 Literature Review

1.1 Paper 1: Impacts of climate change on the livestock food supply chain; a review of the evidence

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [1]

1.1.1 Summary

This study explores the complex interactions between climatic risks, exposure, and socioeconomic vulnerability to enhance our understanding of how climate change affects global livestock supply networks. The cattle industry plays a significant role in the global economy by providing various goods and livelihood support, yet it is highly vulnerable to the impacts of climate change. Climate change encompasses a wide range of hazards, including extreme events such as heatwaves, droughts, floods, cyclones, and wildfires, in addition to gradual shifts in temperature. These climate-related events pose serious risks to cattle production, impacting both infrastructure and the health of the animals. The vulnerability of the cattle supply chain to climate-related dangers varies, with rangeland communities often facing heightened vulnerability in regions where adverse climate effects are anticipated. Small-scale farmers in resource-constrained, hot regions are particularly at risk. The risks associated with climate change in cattle supply chains extend beyond financial losses, affecting various aspects of sustainable livelihoods. These impacts are felt across multiple dimensions, including human, social, natural, physical, and financial

capital, and are influenced by changes at both national and international socioeconomic levels. It is essential to recognize the diversity within the livestock industry. For instance, Oceania, which primarily relies on grazing, faces unique challenges related to climate change and natural disasters. Meanwhile, arid or semi-arid regions in Africa experience greater climate variability and shifting agricultural growing seasons, threatening food security and traditional ways of life. The severity of climate change's impact may necessitate transformative adaptation. This entails implementing a wide range of strategies, including improvements in farm management, technological advancements, income-related responses, and institutional reforms. In some cases, discontinuing cattle rearing may be the only practical option. Ownership of livestock serves various purposes beyond merely providing food. Livestock also supply resources such as wool, hides, skins, manure, and transportation. In disadvantaged communities, livestock can contribute to risk mitigation and income diversification. Their adaptability to climate change makes them valuable assets. Given the complexity of both biophysical and social processes, it is imperative to consider various possible futures. Reliable techniques and policies are needed to manage climate risks in the cattle industry, taking into account the uncertainties associated with risks, exposure, and vulnerabilities. In conclusion, a comprehensive understanding of the effects of climate change is crucial, given the substantial contributions of the livestock sector to the global economy and human livelihoods. Although there remain many unknowns, further research is needed to bridge knowledge gaps, develop adaptation strategies, and reduce the risks associated with climate change in the cattle supply chain

1.1.2 Software Architecture

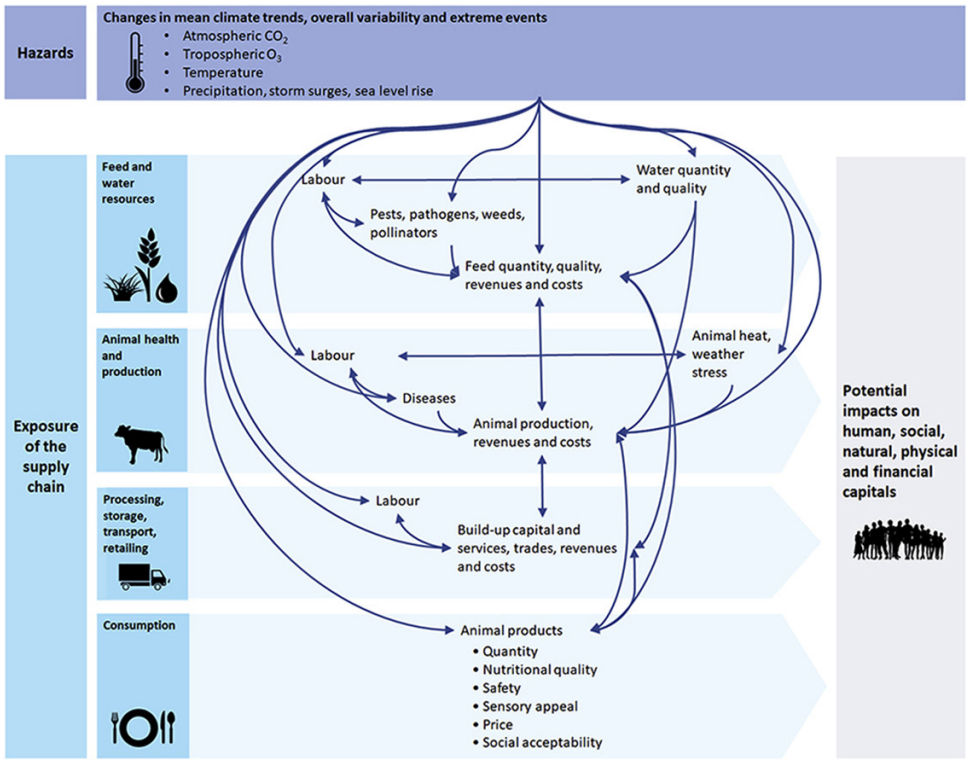

Figure 1: Software architecture diagram for Paper 1.

1.1.3 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S2211912420301413bbib1.

1.2 Paper 2: Climate Change and Children's Mental Health: A Developmental Perspective

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [2]

1.2.1 Summary

The complex and urgent question of how climate change affects mental health and well-being at different stages of development has received a lot of attention lately. This overview of the literature explores the psychological impacts of climate change and emphasizes the significance of taking developmental views into account. The impacts of climate change on human health are complex, involving both physical and psychological aspects, and are increasingly recognized as a worldwide problem with wide-ranging ramifications. While much prior study has concentrated on how climate change affects physical health, its substantial consequences on mental health are becoming increasingly recognized. The necessity to comprehend these implications via a developmental perspective is emphasized by the rising corpus of literature on climate change and mental health. A framework for understanding how climate-related stressors affect people at various periods of life is provided by developmental psychopathology. This approach recognizes that a variety of elements, including physiological, genetic, cognitive, emotional, social, and environmental characteristics, have an impact on development. Multiple factors, including biological, microsystemic, mesosystemic, exosystemic, and macrosystemic impacts, can lead to risks to mental health. Over time, the cumulative, additive, and interactive effects of these factors may increase the vulnerability of mental health. From conception to delivery, the perinatal period stands out as a stage of life marked by a high degree of developmental fragility. Stressors during this time are made worse by climate change, which largely works through biological processes that impact neurological and physiological development. Extreme heat and severe weather events during pregnancy can cause obstetric difficulties and premature birth, which could have an impact on the brain and behavior of the unborn child. Chronic stressors caused by climate change, such as economic downturns and forced migration, can also have a direct impact on mother stress and, as a result, pregnancy outcomes, which in turn affect the development of the fetus. Ages 0 to 5 are considered early childhood, and this period is characterized by large developmental milestones and quick cognitive development. Malnutrition, dehydration, exposure to pollutants, and the existence of vectors are concerns brought on by climate change. These stressors can have an immediate impact on cognitive growth and developmental milestones, which can lead to long-term psychological effects. Children encounter new climate-related stresses throughout middle childhood (ages 6 to 12), which can interfere with learning, leisure time, and social support systems. During this time, acute events like storms and floods continue to be the key pathways to higher psychopathology risk. Adolescence is a time of significant physiological and psychosocial development, as well as a peak in the emergence of new psychiatric diseases. Adolescents are increasingly interested in participating in civic and economic life and are becoming more conscious

of abstract concepts like justice and responsibility. By undermining their educational success, hindering their cognitive and academic performance, and raising knowledge of climate-related issues, climate change can have an impact on teenagers' mental health. This awareness has the potential to exacerbate pre-existing mental health disorders and lower the bar for the start of new ones by inducing feelings of hopelessness and helplessness. Finally, climate change poses serious threats to mental health and wellbeing at all stages of development. The necessity to evaluate these effects via a developmental lens and take into account the particular vulnerabilities and pressures at each stage of life is highlighted by this literature review. For designing effective therapies and policies to alleviate the psychological effects of climate change, it is essential to understand the causal pathways and measurement issues involved. Addressing the effects of climate change on mental health is a question of international and intergenerational justice, highlighting the need for prompt and effective action to safeguard the well-being of both present and future generations. Climate change continues to pose an existential threat.

1.2.2 Software Architecture

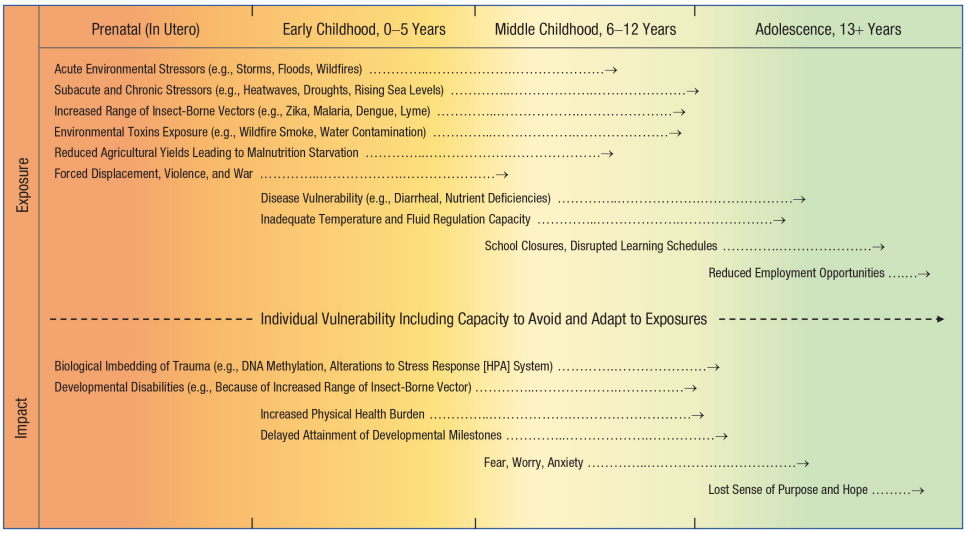

Figure 2: Software architecture diagram for Paper 2.

1.2.3 Paper Link

Access the full paper at https://journals.sagepub.com/doi/full/10.1177/21677026211040787.

1.3 Paper 3: Climate Change and Mental Health: A Scoping Review

Journal/Conference Rank: Q2
Publication Year: 2021
Reference: [3]

1.3.1 Summary

There is a growing corpus of literature in the field of research on the connection between climate change and mental health. In order to provide a complete overview of this developing subject, evaluate the quality of the available data, identify significant research gaps, and suggest future paths, this study undertakes a scoping review under the direction of the World Health Organization's (WHO) global research priorities framework. The review shows that there has been a lot of scholarly research on how climate change affects mental health, which reflects the increasing awareness of climate change as a serious global problem. Nevertheless, despite this growing interest, the field still has to be explored and expanded. The majority of current research examines the threats to mental health posed by climate change and finds a persistently inverse relationship between climate change-related events and mental health outcomes. This focus on hazards draws attention to a crucial gap in applied research: the requirement to look into efficient interventions, laws, and adaption plans meant to protect mental health in the face of climate change. The majority of the research now in publication uses quantitative approaches, and many studies use cross-sectional designs. Additionally, the majority of these research came from high-income nations, which can restrict the applicability of their conclusions. Despite their greater sensitivity to climate change, low- and middle-income nations are noticeably underrepresented in the current research landscape. Future research should put a priority on the creation of efficient interventions, policies, and decision-making frameworks since climate change poses a serious threat to mental health in the twenty-first century. Conclusion: While the profession must shift its focus to practical solutions for protecting mental health, especially among vulnerable people and in low- and middle-income nations, current research emphasizes the negative consequences of climate change on mental health.

1.3.2 Software Architecture

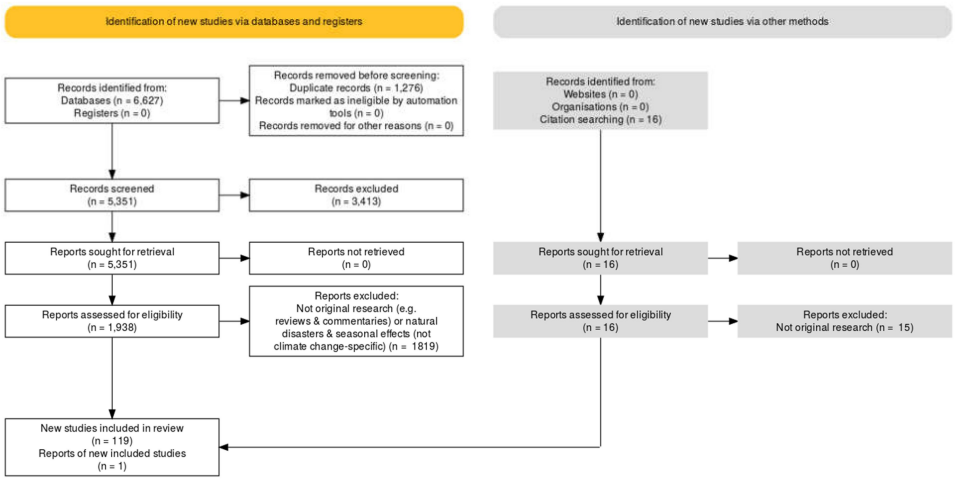

Figure 3: Software architecture diagram for Paper 3.

1.3.3 Paper Link

Access the full paper at https://www.mdpi.com/1660-4601/18/9/4486.

1.4 Paper 4: Is there an association between hot weather and poor mental health outcomes? A systematic review and meta-analysis

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [4]

1.4.1 Summary

The impact of exposure to hot weather, including heatwaves and high ambient temperatures, on mental health outcomes is examined in this systematic review and meta-analysis. The study acknowledged the significance of mental health as a global public health issue and earlier research that suggested a possible connection between heat exposure and mental health. However, the outcomes from various research and areas have been erratic. By methodically compiling the epidemiological data and quantifying the impact of high temperatures and heatwaves on mental health-related mortality and morbidity, this study aims to close knowledge gaps. Exploring the causes of variability in these connections is the goal of the research. The researchers conducted a thorough search of peer-reviewed epidemiology studies published between January 1990 and November 2020 in order to perform their investigation. They looked at research that looked at the relationships between extreme heat or heatwaves and other mental health outcomes, like mortality, hospital admissions, and ER visits. A meta-analysis was conducted to compile the relative risks (RRs) of mental health outcomes per 1 °C temperature increase and under various heatwave definitions. Mental health disorders were diagnosed using the ICD-10 system. In order to explain observed variations, the study also took factors including age, sex, socioeconomic level, and climate zone into account. Over 1.7 million cases of mental health-related mortality and 1.9 million cases of morbidity were included in the 53 relevant papers that were found and evaluated for this analysis. The results show links between heat exposure and a number of outcomes related to mental health. More specifically, a 1 °C rise in temperature was associated with an increase in morbidity and mortality due to mental illness of 1.009 (RR) and 1.022 (RR), respectively. According to the study, organic mental diseases were followed by substance-related mental disorders as the conditions with the highest mortality risk. Additionally, a 1 degree Celsius rise in temperature was associated with a rise in the morbidity of ailments like mood disorders, organic mental diseases, schizophrenia, and neurotic and anxiety disorders. Populations in tropical and subtropical climate zones as well as people over 65 were shown to be more vulnerable. The study also revealed substantial variation in effect estimates, particularly in the categories of overall mortality and morbidity, albeit certain subgroups showed less variation. In conclusion, the systematic review and meta-analysis provide credence to the idea that heatwaves and elevated ambient temperatures are positively correlated with poor mental health outcomes. This issue is anticipated to worsen as climate change causes a hotter climate with more frequent and intense heatwaves. The report underlines the need for additional high-quality research to determine the moderating elements that affect how heat affects mental health, assisting in the development of mitigation solutions for these adverse effects.

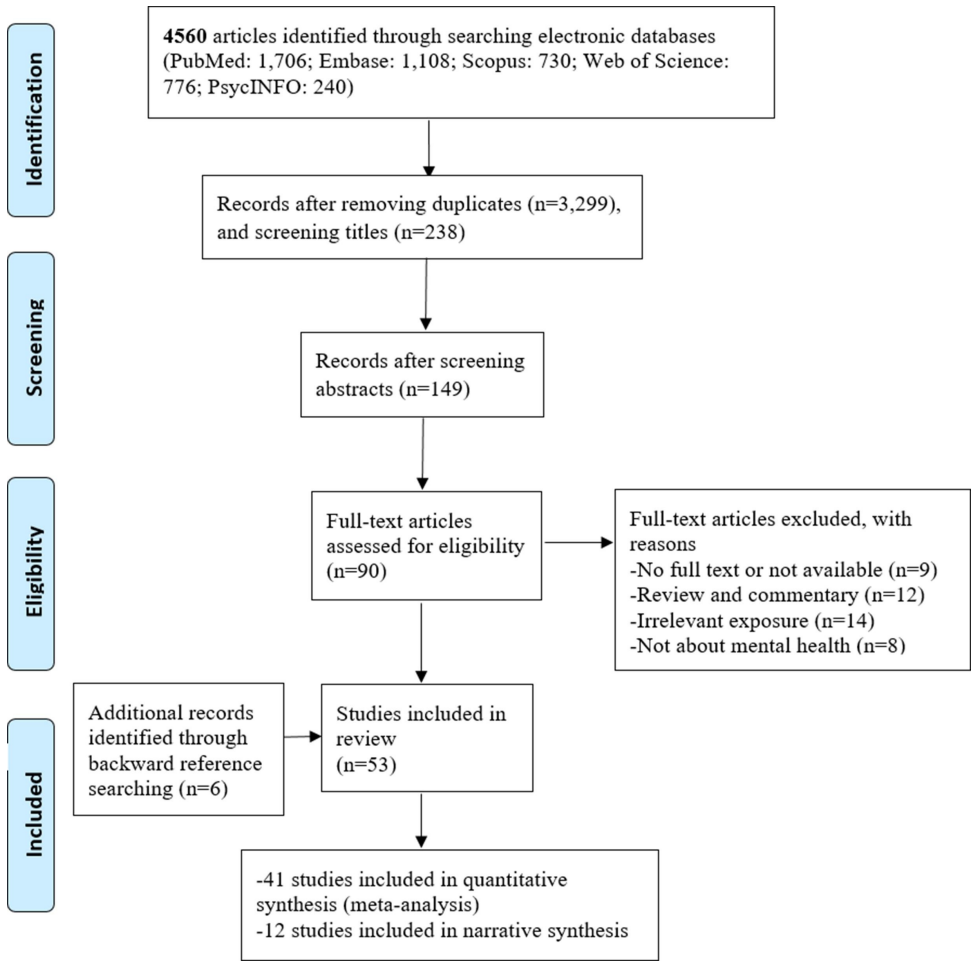

Figure 4: Software architecture diagram for Paper 4.

1.4.2 Software Architecture

1.4.3 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S0160412021001586s0005.

1.5 Paper 5: Impact of Climate Change on Agriculture and Its Mitigation Strategies: A Review

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [5]

1.5.1 Summary

The paper explores the complex interplay between climate change and agriculture, emphasizing potential effects, mitigating actions, and adaptation tactics. In light of a growing population and shifting climatic conditions, it highlights the mounting burden on agriculture to maintain global food security. The following are some of the paper's key conclusions and themes: Exploring the negative effects of climate change on agriculture, this study emphasizes elements including temperature rise, changing precipitation pat-

terns, and elevated greenhouse gas concentrations. These modifications interfere with crop physiology, metabolic processes, pest infestation, and soil fertility. In order to mitigate the negative effects of climate change on agricultural sustainability, a variety of mitigation and adaption measures are suggested. These tactics include practices that are "water-smart," "nutrient-smart," "weather-smart," "carbon-smart," and "knowledge-smart." Crop diversity, stress-tolerant crop varieties, and laser land leveling are a few examples. The report digs into the adoption of climate-smart agriculture technologies and the economic effects of climate change. The economic advantages of these technologies are mentioned, including higher farmer incomes without sacrificing agricultural sustainability. A danger to agricultural productivity and food security is posed by soil degradation and an increase in pest infestation as a result of climate change. The need of using climate-resilient technologies to lessen these adverse effects is stressed throughout the research. The report underlines the necessity for interdisciplinary methods to build climate-resilient technology in order to handle the unpredictable nature of climate change. These methods include creating appropriate crop varieties, agronomic management, and pest management plans. In conclusion, the article emphasizes the intricate connection between agriculture and climate change. It emphasizes how urgent it is to put mitigation and adaptation measures in place to ensure the viability of agriculture in a changing climate. The main lessons emphasize the value of teaching and training farmers in climate-smart technologies as well as transdisciplinary approaches to problems.

1.5.2 Software Architecture

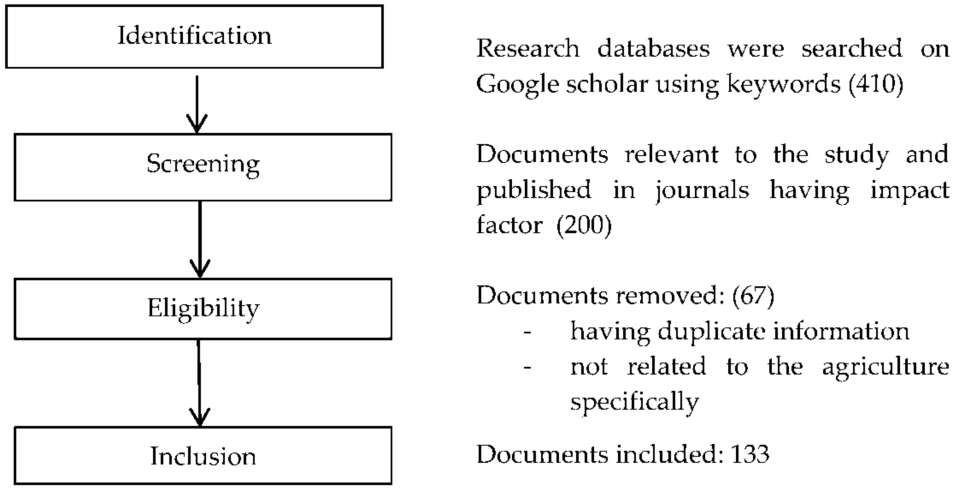

Figure 5: Software architecture diagram for Paper 5.

1.5.3 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/13/3/1318.

1.6 Paper 6: Climate change and its implications for food safety and spoilage

Journal/Conference Rank: Q1
Publication Year: 2022

Reference: [6]

1.6.1 Summary

This research examines how climate change affects food security, food quality, and food deterioration at various points throughout the supply chain. It highlights the urgent concerns that climate change poses to the environment and civilizations by projecting an increase in global temperatures as well as a number of climate-related challenges. Key findings from the research:

Climate change affects food safety both directly and indirectly. It also affects the types of food products, the methods of transmission, the survival and spread of environmental diseases, and human health. The study emphasizes the need for a comprehensive approach, with a focus on mycotoxin and marine bio toxin contamination, environmental residues from human activity, and animal ailments, in order to understand and treat the new threats brought on by climate change. It investigates potential climate change effects on bacterial food deterioration, especially for large quantities of processed foods and dry foods that don't require freezing because they rot easily. There has been a lot of studies on how climate change would affect primary farming and food security, but less has been said about how it will affect food preservation and security. The study's conclusion highlights the significance of being prepared in both the food industry and the development of laws to address the sometimes overlooked effect of climate change on food spoilage caused by microbes. Careful study and action are required in response to the many impacts of climate change on farming, fishing, animal production, and food security.

1.6.2 Software Architecture

The publication does not explicitly mention the software architecture that was used for the research and analysis in the piece we are working on. Instead, it largely focuses on how microbial spoilage, food quality, and safety are impacted by climate change. The software or techniques used in its data collection or analysis are not given a technical analysis. Scientific articles frequently contain a description of the software architecture or tools used, where appropriate, in the technique section. Because the author leaves out this information, it appears that the research is more concerned with the impacts of climate change regarding food safety and quality than with the technical aspects of software design.

1.6.3 Data Parameters

The provided summary does not go into detail on the data parameters utilized in the paper. Depending on the topic of the research, we can make generalizations about the kind of data factors that would be relevant for a study on the effects of climate change on food safety, quality, and microbial degradation. These data parameters are: Information about the relationship between climate change and trends in temperature, precipitation, and extreme weather. These data could originate from climate models, satellite measurements, or weather stations. Information about the bacteria, fungus, and other germs that can cause food to deteriorate. These data may provide details on the rates of microbial growth, optimal growth settings, and spoilage risk. Information about environmental issues like pollution, water quality, and habitat changes that may have an impact on food

safety and quality. For example, information on underwater ecosystems may be useful to assessing the security of seafood. Information about the phases of the food supply chain involved in shipping, storing, and distributing food. This knowledge makes it simpler to comprehend how various phases of food spoilage may be affected by climate-induced changes. It's crucial to realize that the precise data parameters used in the report would depend on the study methodology. The article is likely to make use of information from a range of sources, including governmental organizations, academic institutions, and environmental monitoring systems, to understand the potential impacts of climate change on food safety, quality, and microbiological degradation.

1.6.4 Datasets Used

The synopsis of the study we are working on does not offer any specific information about the datasets. A broad overview of the impact of climate change on food safety, food quality, and microbiological spoilage is provided, however the specific datasets and their importance are not explored in detail.

1.6.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/abs/pii/S0924224421002235.

1.7 Paper 7: Hydrogen production through renewable and non-renewable energy processes and their impact on climate change

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [7]

1.7.1 Summary

This study looks at how urbanization and population growth have a significant impact on the world's energy requirements and the environmental issues they cause, including air pollution, CO2 emissions, greenhouse gases, acid rain, and climate change, all of which are brought on by our heavy reliance on non-renewable fossil fuels. The study looks at hydrogen's potential as an effective and environmentally friendly energy source with a focus on creating "green" hydrogen that emits no carbon in order to address these challenges. The study looks at a number of ways to produce hydrogen, including renewable energy sources like biomass, solar, wind, and geothermal energy as well as conventional non-renewable sources like coal, nuclear power, natural gas, and thermochemical processes. It also examines the economic effects of producing hydrogen from each energy source and the environmental effects of these production processes.

The urgent need to reduce greenhouse gas emissions and the rising energy consumption, which are primarily driven by technical advancements, population growth, and economic progress, are stressed in the introduction. The research emphasizes the importance of shifting to cleaner energy options like hydrogen even though fossil fuels still dominate the energy landscape. Due to its ability to generate only heat and water during production, hydrogen is hailed as an environmentally beneficial fuel that reduces greenhouse gas emissions. The study provides comprehensive information on various hydrogen

production processes and emphasizes the fact that a large portion of hydrogen generation still relies on fossil fuels. However, adopting renewable energy sources is becoming more popular. The research also examines the environmental effects of various manufacturing processes, notably with regard to carbon dioxide emissions and suggested strategies for lowering them, like Carbon Capture and Sequestration (CCS). The study article also focuses on the costs associated with manufacturing hydrogen from non-renewable and renewable sources. It demonstrates that the most widely utilized method for generating sizable amounts of hydrogen which comes from natural gas, and that it may be combined with CCS technology to cut emissions. For instance, the price of natural gas and other associated expenses determine how much hydrogen is produced. The report's conclusion highlights how hydrogen, especially when it comes from sustainable sources, could help with the growth of clean energy and the decrease of greenhouse gas emissions. There is discussion of the challenges and restrictions related to the commercialization of various hydrogen generation technologies.

1.7.2 Software Architecture

This research article does not explicitly explain the software architecture. The influence of various production techniques, environmental effects, economic analysis, and numerous facets of hydrogen production are all covered in the study. It does not, however, go into great depth on any particular software architecture or system that was employed in the study.

1.7.3 Data Parameters

The research paper provides a wealth of background knowledge and details regarding hydrogen production and its environmental impacts, but it makes no explicit mention of any specific data elements. However, we could find some pertinent data parameters as follows:

The growing energy demands on the planet, which are expected to rise 1.3

The COVID-19 pandemic's implications on demand global energy and CO2 emissions are explored in the study together with data on greenhouse gas (GHG) emissions.

Also a set of data can be on the 95 million tons of hydrogen generated globally today, the sources (coal and natural gas) from which hydrogen is created, and the percentage of hydrogen produced from each source.

The cost of creating hydrogen, focusing on methods like Steam Methane Reforming (SMR) and hydrogen production using renewable energy sources like solar energy. Such data could have been used as data parameters.

1.7.4 Datasets Used

Our study report makes no explicit reference to any particular datasets or data sources. Instead, it provides a review of the literature and an overview of a number of issues relating to the production of hydrogen, environmental effects, and energy sources. One may need to consult original research papers, governmental bodies, or organizations that gather and offer statistics on energy production, emissions, and related matters if you're looking for datasets connected to the themes covered in the paper. For pertinent datasets, we can also search academic databases, environmental organizations, and energy research organizations.

1.7.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S0360319922032244.

1.8 Paper 8: Impact of COVID-19 on greenhouse gases emissions: A critical review

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [8]

1.8.1 Summary

In-depth analysis of the COVID-19 pandemic's consequences on greenhouse gas (GHG) emissions, environmental quality, and global economic issues is provided in this report. It provides a thorough analysis of how the pandemic has affected numerous factors, ranging from GHG emissions to global energy usage. The review takes into account pre-, during-, and post-pandemic scenarios to shed light on how the pandemic would affect these fields. Key points of the paper are: Fossil fuel combustion is a major source of GHG emissions, which have a role in climate change. Due to lockdowns and decreased economic activity, the COVID-19 pandemic greatly impacted worldwide energy consumption and GHG emissions. The study gathered pertinent literature, case studies, and data from diverse sources with an emphasis on the environmental and energy consequences of COVID-19. Data analysis revealed a notable increase in studies investigating the impact of COVID-19 on GHG emissions and energy consumption. Rowing GHG emissions and rising global temperatures pose a major threat to the environment. The study highlights how GHG emissions and world temperatures are related, emphasizing how GHGs contribute to climate change. The primary sources of CO2 emissions are large stationary sources like factories and power plants. The COVID-19 restrictions slowed down energy and economic output, thus reduced CO2 emissions, especially in the first few months of 2020. The COVID-19 outbreak caused the global economy more damage than World War II. The fundamental factor for the economic collapse was decreased demand for goods and services, which also had an impact on the global demand for fossil fuels. In order to address the environmental and economic repercussions of global crises, the report underlines the necessity for legislative changes and the execution of stringent measures. Although the pandemic temporarily reduced GHG emissions, underlining the need for cleaner energy sources, the research issues a warning that a speedy return to pre-pandemic economic activity may result in increased emissions. This evaluation highlights the intricate and interconnected issues that the COVID-19 pandemic has caused on the fronts of the environment, energy, and economy, emphasizing the need for long-term remedies in a society post-pandemic.

1.8.2 Software Architecture

We are currently working on a study paper that appears to be a scientific review article examining the effects of the COVID-19 pandemic on greenhouse gas emissions, the environment, energy, and the global economy. The article goes over a number of the pandemic's effects, including the decline in CO2 levels, greenhouse gas emissions, and economic effects. In light of the epidemic, it also underlines the necessity of sustainable

solutions and policies. An abridged description of the software architecture for such a system is given below: Data Collection Module:

Using web scraping technology, the system may gather information from academic publications, websites, and online journals like the Scopus database, Science Direct, and Google Scholar. Collected data should be stored in a well-organized database for easy retrieval and analysis. Module for Data Analysis and Visualization: To find trends, patterns, and correlations in the text data, use statistical studies. To show crucial findings, create data visualizations such as graphs and charts. Putting the increase in global temperatures into graphic form, for instance. Module for Content Categorization and Classification: Create categories for articles using subject modeling techniques, such as "GHG emissions," "economic impact," and "environmental consequences". For simpler navigation and analysis, combine related items. UI: User Interface Develop a web-based user interface so that people may communicate with the system. Implement search tools that let people look for particular subjects or keywords. Provide users with interactive summaries and infographics to explore the research findings. Scalability and effectiveness: Make that the system is capable of efficiently handling a lot of data and user requests. Privacy and security: Implement security procedures to safeguard user information and maintain the system's integrity. Hosting and deployment: Use a web server to deploy the system for public or exclusive access. Updating and maintenance: Update the system frequently to reflect the newest books and scientific discoveries. The COVID-19 influence on many areas is described in this design, with a focus on greenhouse gas emissions, environmental quality, and the global economy. This architecture also specifies a comprehensive system that gathers, analyzes, and delivers information relating to this impact.

1.8.3 Data Parameters

The reference paper highlights a number of issues connected to COVID-19's effects on greenhouse gas emissions, global temperatures, and the economy but does not provide any precise numerical figures. The difficulties brought on by the pandemic are discussed, along with the decrease in greenhouse gas emissions that occurred during the early lockdowns and any potential long-term consequences for environmental and energy policies. The following are a few illustrations of possible data parameters that could be extracted:

Percentage of daily CO2 emissions that will be reduced from the mean level in 2019 by April 2020. Global CO2 emissions decreased by a greater percentage in the first quarter of 2020 (2020Q1) compared to the same period in 2019. The rise in the world's average temperature between 1961 and 1990. Temperature variations on land and in the ocean, such as an increase in temperature of 1.32(plus, minus) 0.04 °C on average on land. Reduction in energy usage, which was about 3.8Demand for fossil fuels will decline by a certain percentage in 2020 (5

1.8.4 Datasets Used

The information presented examines how the COVID-19 epidemic has affected several areas, including as greenhouse gas emissions, world temperatures, and the economy. It provides a comprehensive overview of these concerns but omits any specific datasets or numerical data. One would need to consult scholarly research publications, official reports, or databases that compile such data in order to access datasets pertaining to the topics mentioned in the article. The following datasets could be relevant to the subjects being discussed:

data sets that detail worldwide greenhouse gas emissions from different industries and geographical areas, including carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). Databases including data on the global emissions of greenhouse gases like carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) from various industries and geographical areas. Pieces of information that track changes in the world's temperature throughout time and in different locations. The COVID-19 pandemic has had an impact on a number of economic, energy, and environmental variables, including variations in emissions during lockdowns and recovery periods, according to databases called COVID-19 Impact Data. Datasets on the GDP of the economy, rates of unemployment, and impacts of the COVID-19 pandemic on the energy sector. Information on energy consumption patterns, such as the migration from fossil fuels to renewable sources and the increase in energy demand brought on by the epidemic.

1.8.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S0048969721054267.

1.9 Paper 9: Tackling Climate Change with Machine Learning

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [9]

1.9.1 Summary

Machine learning (ML) professionals can play a critical role in tackling climate change by lowering greenhouse gas emissions and supporting climate adaption. The article identifies a number of fields where ML can make a substantial difference in combating climate change, including electrical systems, alternative fuels and electrification (with a concentration on electric vehicles), energy efficiency building optimization, urban planning, and crisis management.ML has the potential to enhance electric car performance, lower greenhouse gas emissions, and improve grid management in the electrical sector. Building energy efficiency and the creation of smart building systems that react to grid and occupancy signals can both benefit greatly from the use of machine learning (ML). Urban planning can benefit from ML by using it to forecast patterns of energy use and inform policy choices.ML can help with disaster response and the control of epidemics in crisis management by utilizing data from diverse sources to enhance readiness and reaction. The study highlights the necessity for interdisciplinary efforts to successfully address climate change and stresses that ML should be utilized in combination with other fields. It offers countless options for research and useful applications, and it encourages the machine learning community to join the international fight against climate change. The use of ML for climate change adaptation and mitigation offers social advantages as well as chances to advance the field of ML, including tackling issues with data privacy and representativeness. ML can assist with the deployment and upkeep of current low-carbon technologies such as geothermal, nuclear fission, and hydropower. Additionally, it can help with safety-related nuclear fission reactor monitoring.ML can hasten the construction of nuclear fusion reactors by improving experimental layouts and tracking physical processes, which could result in secure and carbon-free electricity generation. Impacts on the current-system can be lessened thanks to machine learning (ML), which

can help by finding leaks and optimizing power plant settings. Additionally, it can help regulate electricity consumption to cut emissions and minimize electrical losses during transmission. ML can lower emissions from sectors like the manufacture of cement and steel by reducing the demand for carbon-intensive materials and enhancing manufacturing techniques. By analyzing data, it can also aid in the discovery of environmentally beneficial materials. ML can help find catalysts and chemical reactions for more environmentally friendly industrial processes, possibly lowering greenhouse gas emissions.ML enables adaptive control for HVAC systems and other industrial activities, as well as the reduction of electricity consumption in enterprises and the optimization of industrial processes for the use of low-carbon energy.ML can contribute to the creation and improvement of techniques for removing CO2 from the atmosphere, including improved plant-based absorption, bioenergy, and mineral weathering. ML can aid in data-driven climate modeling, accelerate climate models, improve cloud modeling, ice sheet dynamics, and sea-level rise projections, as well as uncover correlations between climate variables. It can also help improve ensemble forecasts made from different climate models. Overall, the article underscores the potential for ML to make significant contributions across various domains in the fight against climate change.

1.9.2 Software Architecture

Our current research examines how machine learning (ML) can be a potent tool for combating climate change. It points out numerous areas where ML may significantly contribute to preventing climate change and preparing for its repercussions. The data parameters and areas in the paper where data is essential are listed below: Information about the generation and use of electricity, both historical and current data. Information about the voltage, frequency, and equipment health of the electricity grid. Information on energy sources like nuclear power, renewable energy, and fossil fuels. Information about the maintenance, emissions, and efficiency of power plants. Information on market dynamics and electricity costs. Information on the charging habits of electric vehicles (EVs), including the locations and times of charging. EV consumption trends can be understood using data from in-vehicle sensors and communications. Information about the charge, degradation, and performance of the battery. Information about alternative fuels, including biofuels, hydrogen, and electro fuels. Information on how much energy is used by buildings for heating and cooling as well as electricity. Data from home energy sensors and meters. Data for predicting building energy demand. Information on patterns of appliance energy use. Information about the temperature, humidity, and other environmental factors that affect structures. Information on energy use in cities and by individual buildings. Geographic information, including things like building placement, city plans, and land use. For the purpose of designing policies and urban planning, demographic and economic statistics. Information about the climate and weather to forecast energy use. Data, including web and health data, for disease surveillance and outbreak forecasting. Data from aerial photos for making maps and estimating damage from disasters. Social media data for catastrophe information retrieval. These data characteristics are employed in a variety of applications, including energy consumption forecasting, energy use optimization, modeling of climate-related patterns, and crisis response. The report emphasizes the importance of data quality, availability, and diversity for the effective implementation of ML in various areas and calls on both public and private organizations to make pertinent datasets available for analysis and applications.

1.9.3 Data Parameters

In the research article we've supplied, we talk about how machine learning (ML) is being used in a variety of fields to combat climate change. It highlights how crucial data is to these applications. The study covers the significance of many types of data important to each area, although it does not specifically specify any particular data parameters or datasets. The following are the main data elements covered in the paper: • Information about the generation and use of electricity, both historical and current data. • Information about the voltage, frequency, and equipment health of the electricity grid. • Information on energy sources like nuclear power, renewable energy, and fossil fuels. • Information about the maintenance, emissions, and efficiency of power plants. • Information on market dynamics and electricity costs. Information on the charging habits of electric vehicles (EVs), including the locations and times of charging. • EV consumption trends can be understood using data from in-vehicle sensors and communications. • Information about the charge, degradation, and performance of the battery. • Information about alternative fuels, including biofuels, hydrogen, and electro fuels. • information on how much energy is used by buildings for heating and cooling as well as electricity. • Data from home energy sensors and meters. • Data for predicting building energy demand. • Information on patterns of appliance energy use. • Information about the temperature, humidity, and other environmental factors that affect structures. • Information on energy use in cities and by individual buildings. • Geographic information, including things like building placement, city plans, and land use. • For the purpose of designing policies and urban planning, demographic and economic statistics. • Information about the climate and weather to forecast energy use. data, including web and health data, for disease surveillance and outbreak forecasting. • Data from aerial photos for making maps and estimating damage from disasters. • Social media data for catastrophe information retrieval. These data factors, which are absent from our reference work, are essential for the successful application of machine learning in tackling climate change across multiple domains.

1.9.4 Datasets Used

The paper you gave doesn't mention the individual datasets utilized for the research or specify which ones were used, either. Instead, it talks on the value of data and data difficulties in diverse fields including machine intelligence and climate change. Although the report highlights the importance of data, it doesn't go into detail about the exact datasets used for the study.

1.9.5 Paper Link

Access the full paper at https://dl.acm.org/doi/full/10.1145/3485128.

1.10 Paper 10: Geospatial techniques for monitoring and mitigating climate change and its effects on human health

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [10]

1.10.1 Summary

This article explores the complex relationship between climate change and human health as well as the crucial role geospatial data and technologies play in understanding and resolving these challenges. Here is a summary of the paper in paraphrased form: The opening section of the essay discusses the several ways that climate change affects human welfare and health. It emphasizes the crucial role that geospatial data, methodology, and tools play in accurately assessing the effects of climate change, predicting future trends, and developing successful adaptation and mitigation policies. Extreme weather events, increased carbon dioxide levels, rising temperatures, and rising sea levels are all signs of climate change, which has serious consequences for human health and healthcare services as well as environmental degradation, air pollution, and changes in disease-carrying vectors. Human behavior and climate change are linked because some medical procedures and care delivery methods can exacerbate environmental problems like excessive water and energy use. The way scientists gather and examine data about climate change has been changed by geographic information science(GIS). These geospatial technologies are essential for analyzing how climate change is affecting the world at large. In highlighting the importance of spatial representation and understanding the complex, non-linear, and context-dependent features of climate change and its effects on human health, the study examines the two fundamental facets of geographic information science. The study points out that increased greenhouse gas emissions are to blame for an increase in Earth's surface temperature, which has adverse effects on the environment and human health. GIS in particular, which uses geospatial methods, is essential for tracking these changes and giving enterprises and policymakers priceless information. GIS is helpful in analyzing environmental data, predicting future climatic changes, and fostering interaction between the general public and scientists. The study demonstrates how geospatial data and methods can be used to lessen the effects of heat on urban neighborhoods who are already at risk. It highlights a Los Angeles County initiative that aims to increase urban cover in low-income areas in order to mitigate the consequences of global warming. In order to improve the urban infrastructure of these communities and increase their resilience to excessive heat, geospatial data is crucial for locating the best areas for tree planting. Health and wellbeing are significantly impacted by human-induced climate change, which results in morbidity and death that can be reduced by taking the necessary precautions. For accurate assessments, prognostications, and the creation of effective plans for adapting to and mitigating the effects of climate change, geospatial data, techniques, and technologies are essential. In a nutshell, the research paper basically emphasizes the crucial role played by the geospatial methodologies in comprehending the complex interactions between climate change and human health and in developing solutions to deal with the problems caused by climate change.

1.10.2 Software Architecture

The use of geospatial methods and geographic information science (GISc) to address climate change and its effects on human health is discussed in the study. Although the paper does not directly cover the software architecture, it does explain the major elements and approaches linked to geospatial data and GIS. An overview of the software architecture and tools suggested by the study may be found below: The study examines the collection of geospatial data, including satellite imagery and remote sensing data, for the aim of observing climate change and its effects. These information sources are

gathered, cleaned up, and kept for later study. The focus of the paper is on the analysis and visualization of the gathered data using GIS software and geospatial technologies. These tools assist in analyzing the effects of climate change on human health as well as in mapping, modeling, and simulating various climate change scenarios. Additionally, they aid in the production of visualizations that aid in conveying findings to the general public and decision-makers. The software architecture includes elements for spatial analysis and modeling to comprehend the intricate relationships between place, health, and climate change. This entails evaluating hotspots, projecting the effects of climate change on ecological, and measuring changes in land cover. These analyses are carried out with GISc methods. Geospatial data handling and transformation components are probably included in the software architecture. Additionally, it makes use of visualization techniques to produce clear maps and visuals that are instructive to both scientists and laypeople. The usage of open-source databases for storing and managing big volumes of spatial data is mentioned in the study. Geospatial data storage and retrieval is supported by these databases, which is essential for conducting climate change study. For predictive modeling, such as predicting extreme weather occurrences and their possible effects on infrastructure and human health, geospatial data and methodologies are used. Advanced statistical and computational methods are used in this modeling.

Geospatial intelligence is utilized to assist first responders and recovery personnel during extreme weather events. Real-time monitoring of the environment is probably required, together with updates from the field and hazard maps. In order to make sure that the data and predictions are accurate and trustworthy, the paper examines the validation of geospatial data and methodologies. This entails contrasting model predictions with actual data. The importance of geographic data, GISc methodologies, and software in comprehending and minimizing the consequences of climate change on human health is emphasized in the study, despite the fact that it does not specifically explain the precise software architecture or tools employed.

1.10.3 Data Parameters

The influence of climate change on human health and the usage of geospatial data are all topics covered in this study along with a variety of data parameters and information sources. Here is a summary of the data parameters and sources mentioned in the paper: The importance of geospatial data, which contains details about specific places, scenes, and spatial relationships, is highlighted in the article. Understanding the effects of climate change on various locations depends on geospatial data. Climate data, which includes details on temperature, precipitation, wind patterns, and other meteorological variables, is referred to in the study. To evaluate how the climate has changed over time, this data is employed. The document talks about health data, which contains details on illnesses, health results, and medical services. Understanding how climate change affects human health requires health statistics. The term "environmental data" refers to information regarding environmental aspects such as ecological conditions, water quality, and air quality. Environmental information is used to assess how climate change may affect ecosystems and public health.

The utilization of remote sensing data, which includes data obtained from satellites and other distant sensors, is highlighted in the study. For tracking environmental changes and climate-related occurrences, remote sensing data is useful.

Satellite imagery is noted as a source of information for monitoring surface changes to

the Earth, such as ice sheet melting and increasing sea levels. It is employed to evaluate the effects of climate change. The study covers information on pedestrian traffic in the context of reducing the effects of heat in metropolitan neighborhoods. To evaluate the flow of people in metropolitan areas, this data is used. The usefulness of tree canopy data for comprehending the distribution of trees in urban environments is emphasized in the article. It is essential for urban planning to lessen the effects of heat. The report makes references to social and economic data, which includes details on demographics, income levels, and past trends in social and environmental risk. This information aids in understanding how various communities may be impacted by climate change. The usage of GIS (Geographic Information Systems) software and tools, which are used to analyze, visualize, and interpret geospatial data but are not data themselves, is discussed in the paper. For the purpose of combining and making sense of diverse data parameters, GIS is crucial. The research underlines the value of diverse data sources and geospatial methodologies in order to evaluate the intricate interactions between climate change and its effects on human health and wellbeing.

1.10.4 Datasets Used

The use of particular datasets is not expressly stated in the paper. Instead, it explores different information sources and data kinds that are pertinent to the discussion of climate change and its effects on human health. Among these data sources are: Information concerning geographic locations, landscapes, and spatial relationships is referred to as geospatial data. Geospatial data is important because it can provide different environmental and health-related variables a spatial context. The spatial distribution of climate-related phenomena and their impacts on human health can be studied using the data provided. Environmental data comprises details about numerous environmental aspects, such as ecological conditions, water quality, and air quality. This information is important because it makes it possible to assess how ecosystems and resources directly affecting human health, such air and water, are being affected by climate change. Data acquired from satellites and other distant sensors is referred to as remote sensing. It is useful for keeping track of environmental changes like sea level rise and ice sheet melting. This information aids in determining how the Earth and its inhabitants will be impacted by climate change. Data on pedestrian traffic is crucial for comprehending how people move about cities in the context of reducing the effects of heat on urban areas. The places with heavy foot traffic and potential heat-related problems for city dwellers are identified using this data. Data on tree canopy are crucial for determining how trees are distributed in metropolitan environments. By increasing green cover, which can offer shade and lessen urban heat islands, it aids in efforts to offset the effects of the heat on urban planning. For an understanding of the social determinants of health, it is important to consider social and economic information including income levels, demographics, and historical trends in social and environmental risk. This information helps in determining how socioeconomic factors contribute to how differently affected communities are by climate change. While not a dataset in and of themselves, GIS (Geographic Information Systems) software and tools are essential for integrating, analyzing, and displaying the different geographic and environmental data sources. GIS is important for understanding the nuanced connections between geography, climate, and health. The study of the complex effects of climate change on human health and the environment emphasizes the value of these data kinds and information sources.

1.10.5 Paper Link

Access the full paper at https://ij-healthgeographics.biomedcentral.com/articles/10.1186/s12942-023-00324-9.

1.11 Paper 11: A review of the global climate change impacts, adaptation, and sustainable mitigation measures

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [11]

1.11.1 Summary

This paper discusses global climate change impacts, adaptation, and sustainable mitigation measures. Climate change is a long-lasting change in the weather arrays across tropics to poles. It is a global threat that has embarked on to put stress on various sectors. This study is aimed to conceptually engineer how climate variability is deteriorating the sustainability of diverse sectors worldwide. Specifically, the agricultural sector's vulnerability is a globally concerning scenario, as sufficient production and food supplies are threatened due to irreversible weather fluctuations. In turn, it is challenging the global feeding patterns, particularly in countries with agriculture as an integral part of their economy and total productivity.

Related study on this topic gives the following information. Today, we live an ordinary life in the beautiful digital, globalized world where climate change has a decisive role. What happens in one country has a massive influence on geographically far apart countries, which points to the current crisis known as COVID-19 (Sarkar et al. 2021). The most dangerous disease like COVID19 has affected the world's climate changes and economic conditions (Abbass et al. 2022; Pirasteh-Anosheh et al. 2021). The purpose of the present study is to review the status of research on the subject, which is based on Global Climate Change Impacts, adaptation, and sustainable mitigation measures by systematically reviewing past published and unpublished research work. Furthermore, the current study seeks to comment on research on the same topic and suggest future research on the same topic. Specifically, the present study aims. The first one is, organize publications to make them easy and quick to find. Secondly, to explore issues in this area, propose an outline of research for future work.

Climate change and agriculture: Global agriculture is the ultimate sector responsible for 30-40

Climate change on biodiversity: Global biodiversity is among the severe victims of climate change because it is the fastest emerging cause of species loss. Studies demonstrated that the massive scale species dynamics are considerably associated with diverse climatic events (Abraham and Chain 1988 Manes et al. 2021 A. M. D. Ortiz et al. 2021). Both the pace and magnitude of climate change are altering the compatible habitat ranges for living entities of marine, freshwater, and terrestrial regions. Alterations in general climate regimes influence the integrity of ecosystems in numerous ways, such as variation in the relative abundance of species, range shifts, changes in activity timing, and microhabitat use (Bates et al. 2014). The geographic distribution of any species often depends upon its ability to tolerate environmental stresses, biological interactions, and dispersal constraints. Hence, instead of the CC, the local species must only accept,

adapt, move, or face extinction (Berg et al. 2010). So, the best performer species have a better survival capacity for adjusting to new ecosystems or a decreased perseverance to survive where they are already situated (Bates et al. 2014). An important aspect here is the inadequate habitat connectivity and access to microclimates, also crucial in raising the exposure to climate warming and extreme heatwave episodes. For example, the carbon sequestration rates are undergoing fluctuations due to climate-driven expansion in the range of global mangroves (Cavanaugh et al. 2014). Similarly, the loss of kelp-forest ecosystems in various regions and its occupancy by the seaweed turfs has set the track for elevated herbivory by the high influx of tropical fish populations. Not only this, the increased water temperatures have exacerbated the conditions far away from the physiological tolerance level of the kelp communities (Vergs et al. 2016; Wernberg et al. 2016). Another pertinent danger is the devastation of keystone species, which even has more pervasive effects on the entire communities in that habitat (Zarnetske et al. 2012). It is particularly important as climate change does not specify specific populations or communities.

Climate change impacts on the economic sector: Climate plays a significant role in overall productivity and economic growth. Due to its increasingly global existence and its effect on economic growth, CC has become one of the major concerns of both local and international environmental policy makers (Ferreira et al. 2020 Gleditsch 2021 Abbass et al. 2021; Lamperti et al. 2021). The adverse effects of climate change on the overall productivity factor of the agricultural sector are therefore significant for understanding the creation of local adaptation policies and the composition of productive climate policy contracts.

The study also discusses the strategies for mitigation and adaptation of climate change. Adaptation and mitigation are the crucial factors to address the response to climate change (Jahanzad et al. 2020). Researchers define mitigation on climate changes, and on the other hand, adaptation directly impacts climate changes like floods. To some extent, mitigation reduces or moderates greenhouse gas emission, and it becomes a critical issue both economically and environmentally (Botzen et al).

In conclusion, specific socio-agricultural, socio-economic, and physical systems are the cornerstone of psychological well-being, and the alteration in these systems by climate change will have disastrous impacts. Climate variability, alongside other anthropogenic and natural stressors, influences human and environmental health sustainability. Food security is another concerning scenario that may lead to compromised food quality, higher food prices, and inadequate food distribution systems.

Solutions provided in this study include: 1. Seasonal variations and cultivation practices. Warming might lengthen the season in frost-prone growing regions temperate and arctic zones, allowing for longer-maturing seasonal cultivars with better yields (Pfadenhauer 2020; Bonacci 2019). Extending the planting season may allow additional crops each year when warming leads to frequent warmer months highs over critical thresholds, a split season with a brief summer fallow may be conceivable for short-period crops such as wheat barley, cereals, and many other vegetable crops. The capacity to prolong the planting season in tropical and subtropical places where the harvest season is constrained by precipitation or agriculture farming occurs after the year may be more limited and dependent on how precipitation patterns vary (Wu et al. 2017). 2. New varieties of crops. The genetic component is comprehensive for many yields, but it is restricted like kiwi fruit for a few. Ali et al. 2017 investigated how new crops will react to climatic changes also stated in (Mall et al. 2017). Hot temperature, drought, insect resistance, salt toler-

ance and overall crop production and product quality increases would all be advantageous (Akkari 2016). Genetic mapping and engineering can introduce a greater spectrum of features. The adoption of genetically altered cultivars has been slowed, particularly in the early forecasts owing to the complexity in ensuring features are expediently expressed throughout the entire plant, customer concerns, economic profitability, and regulatory impediments (Wirehn 2018 Davidson et al. 2016). 3. Changes in management and other input factors To get the full benefit of the CO2 would certainly require additional nitrogen and other fertilizers.

1.11.2 Paper Link

Access the full paper at https://link.springer.com/article/10.1007/s11356-022-19718-6.

1.12 Paper 12: On the Impact of Climate Change on Building Energy Consumptions: A Meta-Analysis

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [12]

1.12.1 Summary

The body of literature on climate change impacts on building energy consumption is rising, driven by the urgency to implement adaptation measures. Nevertheless, the multitude of prediction methodologies, future scenarios, as well as climate zones investigated, results in a wide range of expected changes. For these reasons, the present review aims to map climate change impacts on building energy consumption from a quantitative perspective and to identify potential relationships between energy variation and a series of variables that could affect them, including heating and cooling degree-days HDDs and CDDs, reference period, future time slices and IPCC emission scenarios, by means of statistical techniques.

Methodology: The two key phases of the approach used to carry out the task are described below. First, a review of the prior research was conducted to compile articles on the subject, and those that were appropriate for doing the quantitative analysis were chosen. Second, pertinent information related to the issue statement was taken out to create the datasheet for the meta-analysis. Selection of Studies the preferred reporting items for meta-analyses and systematic reviews PRISMA rules and declarations people were seen conducting the literature review, which entails the following five steps: the research topic, the keywords, the eligibility criteria, the studies to be chosen for the qualitative analysis based on those criteria, and the studies to be chosen for the quantitative analysis. Based on the research questions, the following keywords were identified to conduct the search. In order to gather articles about climate change Climate change impact climate change altering climate future climate condition future scenarios future weather data future climate variables weather files future projections. to gather writings on construction-related topics. to compile content on topics on energy demand, usage, performance, and evaluation. The Boolean search queries to be used on the database were made by combining the aforementioned terms. The investigation was done in the Scopus bibliographic databases, which, together with Web of Science, are thought to be the most trustworthy databases. In several research comparing the two databases,

it has been shown that Scopus has a broader coverage of journals and scientific output than Web of Science. Additionally, Scopus indexed articles more quickly than Web of Science, making it possible to find more current publications by enhancing the data set with up-to-date papers.

This research reviewed the current level of knowledge about how climate change affects how much energy buildings use, tackling the issue from a quantitative standpoint. In fact, a sample of research articles was chosen based on a set of inclusion criteria connected to the issue statement, and their key traits were collected and summarized in a matrix, gathering information on the parameters thought to be significant. Thus, quantitative studies were carried out using these factors as a foundation. The following list summarizes the key conclusions of this study: Geographically, the distribution of the research does not appear to be uniform around the world; rather, a plurality of studies was seen in Europe, far-east Asia, and the eastern United States, with a special emphasis on climate zone C 65 of studies.

1.12.2 Software Architecture

Describe the software architecture used in the paper.

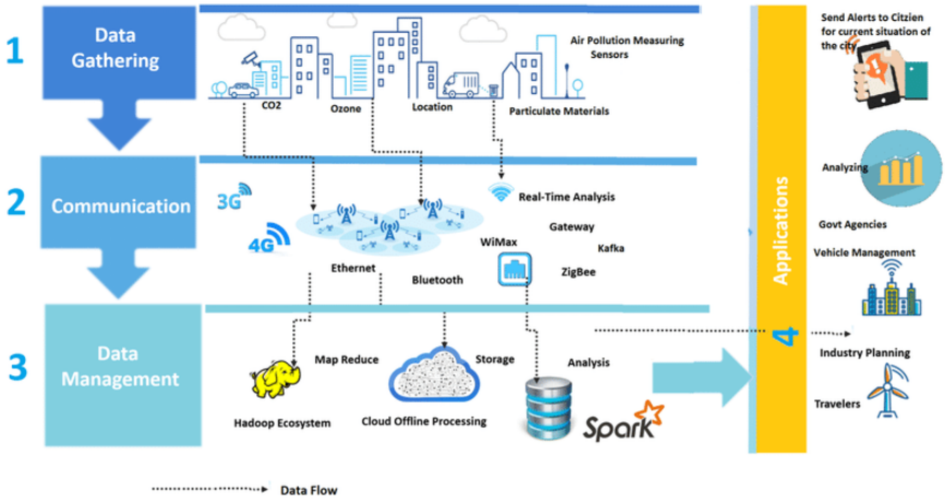

Figure 6: Software architecture diagram for Paper 1.

1.12.3 Paper Link

Access the full paper at https://www.mdpi.com/1996-1073/15/1/354.

1.13 Paper 13: Impacts of climate change on global food trade networks

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [13]

1.13.1 Summary

Climate change may redistribute crop yields across borders, posing a challenge for climate adaptation planning. This paper investigates the long-term impacts of climate change on global food trade networks of wheat, rice, and maize. The analysis proceeds in three steps, using network community detection to analyze how the concentration of global production may become disrupted. The stability of food trade network structures differs between crops, and threats to global food security may depend on production change in a few major producers. Overall, the model contributes a baseline analysis of cross-border climate impacts.

This study identifies potential disruptions in food trade networks due to projected climate change impacts. The yield level of major producers determines how vulnerable trade networks may become. Furthermore, cross-border climate impacts are likely to cause disruptions to the available supply. The distribution of cross-border production change in a community may be a determinant of vulnerability for individual countries. Few countries may be able to buffer their production loss with imports from existing, close trade partners. Trade as an adaptation mechanism may be more viable for wheat and rice than it is for maize.

The simplicity of the model limits its ability to isolate the cause-and-effect relationship between climate change impacts and trade disruptions. Future research could include economic modeling or the application of 'discount factors' to particular nodes. The analysis has been conducted using a single year's trade data, which may contain fluctuations or deviations from the average trade situation. Additionally, the analysis does not capture substitution of products or the relative importance of the trade of secondary or derived commodities.

In conclusion, the study explores how current food trade between countries may be disrupted under long-term climate change impacts. The trade community structure for wheat and rice is either stable or only slightly changed. The study provides a baseline framework for more detailed study of potential threats to global food security and highlights the need for international cooperation on adaptation.

1.13.2 Paper Link

Access the full paper at https://iopscience.iop.org/article/10.1088/1748-9326/aca68b/meta.

1.14 Paper 14: Impact of climate change on allergic diseases in Germany

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [14]

1.14.1 Summary

This study discusses how climate change affects the occurrence, frequency, and severity of allergic diseases. The article explores direct and indirect effects of climate change on allergies, including pollen allergens and occupational inhalation. It also provides recommendations on pollen and fungal spores monitoring, allergy and sensitisation monitoring, urban planning under allergological aspects, and changes in the working environment.

Pollen is the main trigger for allergic respiratory diseases. Pollination occurs through water, animals, or wind, with zoogamy being the most common method. Anemophilous plants, such as hazel, alder, birch, oak, grasses, and mugwort, have the most allergy-relevant pollen.

The study also states the direct and indirect effects of climate change and allergies. Study says, Germany's mean air temperature is expected to increase by at least 1°C to more than 4°C by the end of the century. Precipitation in Germany has increased by 8

From this paper, we can also study the relationship between atopic dermatitis and climate change. Air pollutants and pollen have adverse effects on people with allergies, depending on factors such as exposure duration, ventilation, and climatic conditions. Pollen grains show changes in biological and reproductive functions, physico-chemical properties, allergenic potential, and potential health risks. Atopic dermatitis is a chronic, itchy, inflammatory skin disease that is triggered and exacerbated by environmental changes. It is a major risk factor for the development of allergies, allergic asthma, eosinophilic oesophagitis, and urticaria. Older persons and those with comorbidities are also becoming vulnerable groups to the consequences of climate change.

Influence of air pollution on pollen grains, aeroallergens and allergic reactions is also stated in this paper. Air pollutants and pollen have adverse effects on people with allergies. The effects depend on various factors, including exposure duration, ventilation, and climatic conditions.. Air pollution seems to have several effects on pollen grains. Pollen grains undergo changes in biological and reproductive functions, physico-chemical properties, allergenic potential, and potential health risks.

Climate change is causing an increase in inhalation allergies and other atopic discomforts worldwide. Environmental factors such as air pollutants and climate can influence the allergenicity of pollen through chemical modifications and accumulation, leading to the formation of new allergens. Thunderstorm asthma is a phenomenon where people with hay fever can suffer severe asthma attacks in exceptional circumstances. Climate changes also lead to changes in flora, fauna, and fungi, favoring the growth of plants and fungi and the spread of animals, including pests. Insect components are considered relevant aeroallergens, especially in warm climates. Allergen immunotherapy is still the only treatment option for individual allergens in patients, and allergens extracts may need to be adapted to the respective sensitisation profile. Climate change must ensure that relevant allergens are contained in adequate concentrations in extracts. Politicians and healthcare workers should consider findings from basic scientific research, environmental, working environment, and disease monitoring in their actions to address climate change.

1.14.2 Paper Link

Access the full paper at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10548488/sec1-1title.

1.15 Paper 15: Title

Journal/Conference Rank: Q1
Publication Year: Year
Reference: [1]

1.15.1 Summary

1.15.2 Software Architecture

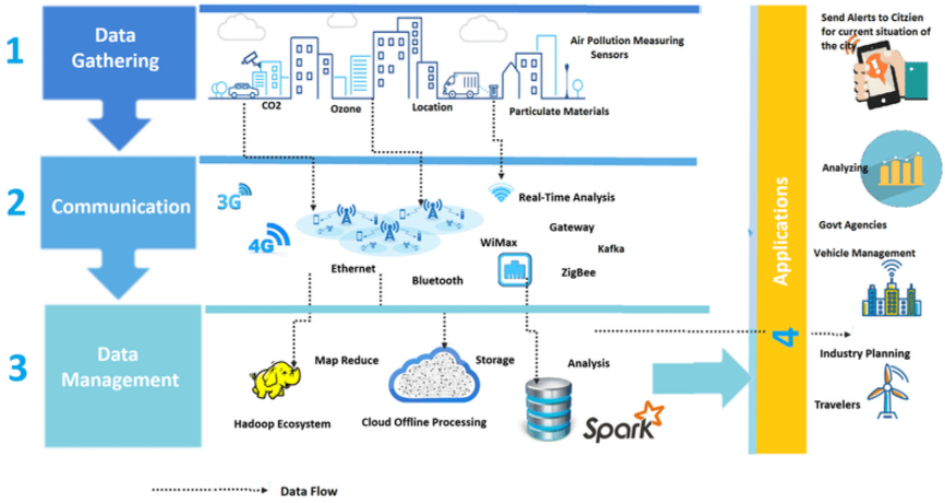

Figure 7: Software architecture diagram for Paper 1.

1.15.3 Paper Link

Access the full paper at http://www.example.com/jse/vol15/issue3/paper1.pdf.

1.16 Paper 16: A Low-Cost Web Application System for Monitoring Geometrical Impacts of Surface Subsidence

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [15]

1.16.1 Summary

The paper presents a low-cost web application system for monitoring surface subsidence due to factors like coal mining and rapid urbanization in Nigeria. It utilizes the Differential Interferometric Synthetic Aperture Radar (DInSAR) technique with Sentinel-1 SAR data to assess horizontal and vertical deformation risks. The web application follows a model-view-controller (MVC) architecture, offering an interactive user interface. The study focuses on the Onyeama Mine Field in Enugu State, Nigeria, and provides valuable predictions of future subsidence trends.

1.16.2 Software Architecture

The web application system follows a model-view-controller (MVC) architecture. It incorporates technologies like HTML, CSS, JavaScript, PostGIS, Geoserver, and Apache Tomcat to create an interactive user interface for users to monitor subsidence risks.

1.16.3 Data Parameters

The study uses Differential Interferometric Synthetic Aperture Radar (DInSAR) data to assess horizontal and vertical deformation. It categorizes risks as low, medium, or high based on the magnitude of deformation. The application also provides information about building and road networks at risk within the study area.

1.16.4 Datasets Used

The primary dataset is Copernicus Sentinel-1 SAR data, comprising 60 Terrain Observation with Progressive Scans SAR (TOPSAR) Single Look Complex (SLC) images acquired from 2016 to 2020. Additionally, the study uses secondary data, including GPS field data from 14 investigation locations and vector shapefiles of building and road networks digitized from georeferenced high-resolution Google Earth images of 2020 within the study area. These datasets are crucial for monitoring and predicting subsidence hazards.

1.16.5 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/14/21/14240 .

1.17 Paper 17: Mobile phone network data reveal nationwide economic value of coastal tourism under climate change

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: [16]

1.17.1 Summary

The study presents a unique approach using mobile phone network data to evaluate the current nationwide human welfare associated with coastal tourism at Japanese beaches and project the value changes under four climate change scenarios. The results show that the projected national economic value loss rates are more significant than the projected national physical beach loss rates. Regional differences in recreational values are observed, with most southern beaches losing economic value, while northern beaches are relatively unaffected. These findings provide insights into changes in beach ranks based on economic values and have implications for policymakers in discussing management priorities under climate change.

1.17.2 Software Architecture

The study utilizes mobile phone network data provided by NTT DOCOMO, a leading mobile phone company in Japan. The data, known as Mobile Spatial Statistics (MSS), include information on the estimated population in each 500-square-meter grid and are derived from hourly operational data. The study applies a zonal Travel Cost Method (TCM) to estimate coastal tourism values based on the relationship between travel costs and visitation rates. The approach includes calculating fuel costs, opportunity costs, and the distance to reach each beach from users' residences.

1.17.3 Data Parameters

The study uses mobile phone network data to estimate human welfare and economic values of coastal tourism. These data provide information on user demographics, location, and the number of users in each grid, allowing for the estimation of visitor turnover at each beach. The study considers seasonal variations in coastal tourism values, focusing on both summer and winter.

1.17.4 Datasets Used

The study extracts data from 536 beaches across Japan based on a list from the Ministry of the Environment. To assess coastal tourism values, the authors selected 274 research sites (202 in summer and 72 in winter) that were applicable for the Travel Cost Method. The data are used to estimate the economic values of coastal tourism at each beach per day and project future economic values under different climate change scenarios (RCP2.6, RCP4.5, RCP6.0, and RCP8.5). The study also incorporates geographical features and regional data to analyze spatial changes in beach economic values and changes in beach ranks.

1.17.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S0261517719302080.

1.18 Paper 18: State of the art review of Big Data and web-based Decision Support Systems (DSS) for food safety risk assessment with respect to climate change

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: [17]

1.18.1 Summary

The reviewed papers discuss the application of Big Data and Decision Support Systems (DSS) in the context of food safety, particularly concerning climate change. These papers emphasize the need to efficiently manage and analyze vast datasets to make informed decisions regarding food safety. The integration of climate change data into DSS tools is recognized as crucial. Key components of the proposed web-based DSS framework include data preprocessing, data analytics, decision-making, and insights to facilitate more effective decision-making. The papers also highlight the potential of automated text analysis, food consumption data, and blockchain technology in enhancing food safety. However, the literature suggests challenges such as limited expertise, high costs, and the need for substantial software development projects.

1.18.2 Software Architecture

The common software architecture theme across the reviewed papers involves the development of web-based Decision Support Systems (DSS). These systems include components for data preprocessing, data analytics, decision-making, and insights. Data preprocessing

ensures data quality and relevance, while data analytics employs various mathematical and analytical models for complex data analysis. Decision-making involves human interaction to view analytical results and make informed choices. The insights component translates decisions into collections and provides feedback for future improvements.

1.18.3 Data Parameters

The reviewed papers emphasize the importance of handling large and diverse datasets. Data parameters vary, including food safety data, climate change data, food consumption habits, and text-based information from scientific opinions. Additionally, data parameters encompass details about food supply chains, production methods, pathogen occurrences, and environmental factors.

1.18.4 Datasets Used

Food safety databases (e.g., EFSA's food consumption database). Textual data from scientific opinions, academic journals, and news reports. Food consumption data collected from IoT devices and mobile apps. Blockchain-based data for supply chain transparency and traceability.

1.18.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S0924224421005185.

1.19 Paper 19: Using Satellite Data to Optimize Wheat Yield and Quality under Climate Change

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [18]

1.19.1 Summary

The study presented in this research article focuses on using remote sensing, specifically MODIS land surface temperature (LST) data, to develop a tool for optimizing wheat field management. The tool aims to help farmers make informed decisions about choosing the right wheat cultivar and sowing time based on the local environmental conditions during the grain-filling period. The research includes the analysis of multiple cultivar experiments across different environmental conditions and the development of a Google Earth Engine (GEE) app to provide real-time information to farmers. The primary goal is to mitigate the adverse effects of high-temperature stress on wheat crops in semi-arid and arid regions. The app can also be used to assess climate change impacts and adaptation strategies.

1.19.2 Software Architecture

The study uses the Google Earth Engine (GEE) platform to analyze time series of MODIS LST data, making it accessible to non-expert stakeholders, such as farmers. The GEE app provides the means to select different cultivars and emergence dates, which allows users

to predict the heading date for each wheat field. This architecture facilitates practical and real-time decision-making for farmers and scientists.

1.19.3 Data Parameters

MODIS Land Surface Temperature (LST): The study utilizes MODIS LST data, which provides global coverage with high spatial resolution and accuracy. The data reveal the temperature conditions of various locations, and temporal Fourier analysis (TFA) is applied to derive climatological temperatures and anomalies. Growing Degree Days (GDD): GDD is calculated based on daily average temperature above a base threshold of 0°C, and it is used to estimate the time from emergence to heading for different wheat cultivars.

1.19.4 Datasets Used

Gilat-CAL: Data from 76 wheat variety test experiments conducted at Gilat Research Center, spanning ten growth seasons, is used for calibration. Saad-VAL: Data from commercial wheat fields at Saad over four growth seasons is used for validation. CVexp-VAL: Data from 28 wheat variety test experiments conducted across Israel over four growth seasons is also used for validation.

1.19.5 Paper Link

Access the full paper at https://www.mdpi.com/2072-4292/13/11/2049.

1.20 Paper 20: Fostering the development of climate services through Copernicus Climate Change Service (C3S) for agriculture applications

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: [19]

1.20.1 Summary

The reviewed papers emphasize the importance of the Copernicus Climate Change Service (C3S) in providing consistent and reliable climate data for various sectors, with a focus on agriculture. The C3S, through its Climate Data Store (CDS) and Toolbox, offers an efficient way to process large datasets for tailored user-driven applications. The reviewed examples include characterizing grapevine growing regions, tracking the distribution of disease vectors, and supporting evidence-based policies and planning in agriculture. Common themes include the need for user-specific climate data, transparent methodologies, and data-driven decision-making in climate-sensitive sectors. The literature suggests a significant gap in the widespread adoption of these tools and methods, calling for more research to bridge this transition. Future research should focus on user education, sector-specific application development, and expanding the utilization of C3S data in various sectors, ultimately fostering a climate-resilient society.

1.20.2 Software Architecture

The software architecture discussed in the papers revolves around the C3S, which provides a comprehensive platform for accessing, processing, and visualizing climate data. The core component is the CDS, which acts as a unified entry point for various quality-controlled climate datasets. The CDS Toolbox offers computational tools for users to work with the data efficiently, enabling the development of tailored applications. The software architecture is user-friendly, transparent, and promotes data-driven decision-making.

1.20.3 Data Parameters

The papers discuss various data parameters relevant to the agriculture sector and other climate-sensitive areas. For agriculture, parameters like Growing Degree Days, temperature, and precipitation are critical for characterizing grapevine regions, tracking disease vectors, and supporting crop-specific interpretations. These data parameters enable the development of indicators that are crucial for decision-making in agriculture and related fields.

1.20.4 Datasets Used

The papers rely on datasets available through C3S, including surface air temperature data, re-analyses, climate projections, seasonal forecasts, and satellite observations. These datasets serve as the foundation for generating sector-specific indicators and user-driven applications. By harnessing the wealth of climate data available, the papers demonstrate the utility of C3S in addressing climate challenges in agriculture and related sectors.

1.20.5 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S2212094719300994.

1.21 Paper 21: The Applicability of Big Data in Climate Change Research: The Importance of System of Systems Thinking.

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [?]

1.21.1 Summary

The paper you've provided aims to explore the interrelationship between data science and climate studies, focusing on the use of Big Data tools to address sustainability climate issues. The paper addresses the following key aspects: 1. Background and Context: The paper introduces the importance of climate change as a pressing issue and the need for data-based models and decision support techniques to understand its complexity. 2. Objectives and Research Questions: The paper outlines three main research questions: a. How and when does Big Data appear in climate-related studies? b. What research has been conducted on Big Data applications in climate studies, and how are they structured? c. How can knowledge from diverse specific research areas be integrated? 3. Significance

of 2015: The year 2015 is highlighted as significant in climate research due to the United Nations' declaration of sustainable development goals and the signing of the Paris Agreement. These developments emphasize the need for a holistic, interdisciplinary approach to climate change. 4. Role of Big Data: Big Data is described as a valuable tool for monitoring climate change, understanding climate change as a data science paradigm, managing climate change risks, exploring soft data sources, and studying systems of systems (SoS), such as the Global Earth Observation System of Systems (GEOSS). 5. Integration of Sustainability and Data Science: The paper emphasizes the increasing intertwining of sustainability science with data science, and how data and analysis methods need to be included in the framework for solving complex sustainability problems. 6. Multidisciplinary Approaches: The growing complexity and resolution of climate and sustainability science are highlighted, which calls for multidisciplinary approaches in climate computational sciences. 7. System of Systems (SoS) Thinking: The paper suggests that SoS thinking can help bridge the gap between industry initiatives and scientific research in climate change. It emphasizes the importance of recognizing and exploiting synergies and trade-offs between new research directions. 8. Research Methodology: The paper outlines the research methodology, including the identification of sustainability science problems and the use of the PRISMA method for a literature review. It highlights the multidisciplinary nature of the issue. 9. Findings and Structure of the Paper: The paper describes the findings based on the research questions, emphasizing the importance of the System of Systems theorem in addressing climate issues and proposing a SoS framework for integrated knowledge management. 10. Section-by-Section Overview: - The paper provides a section-by-section overview, including a focus on sustainability science, data management, the systematic review of climate change analyses, connections between Big Data and climate, and social aspects. It also outlines the SoS framework and its intertwining with sustainable development goals. Overall, the paper aims to provide insights into the role of data science, Big Data, and interdisciplinary approaches in addressing climate change and sustainability issues. It highlights the importance of integrating diverse research findings to develop comprehensive solutions for climate-related challenges.

1.21.2 Paper Link

Access the full paper at https://www.frontiersin.org/articles/10.3389/fenvs.2021.619092/full.

1.22 Paper 22: Big Data and Climate Change

Journal/Conference Rank: Q1
Publication Year: 2019
Reference: [?]

1.22.1 Summary

evelopment of big data analytics and its relevance to various subjects, emphasizing the unique challenges posed by climate science due to its data-intensive nature. Background: The abstract notes that climate change has been a focus of big data research over the past few decades, with numerous applications and advancements related to big climate data. Research Gap: The authors of the review point out that despite the extensive existing literature on big data in climate change, there has been a lack of recent reviews. This

is especially critical because the field is rapidly evolving with new technological developments. Objective: The abstract describes the objective of the literature review, which is to provide the most up-to-date overview of big data applications in climate change studies. The review covers the most recent research in the field, making it a comprehensive and current resource for researchers and practitioners. Contributions: The abstract lists several contributions of the review, including: Presenting the latest comprehensive review of big data applications in climate change. Serving as a one-stop directory for researchers to access the most current information in the field. Summarizing popular research trends and identifying underexplored applications. Helping researchers and practitioners understand the current research landscape and potential research gaps. Classification of Studies: The abstract mentions that the review classifies studies into two fundamental elements: big climate data resources and big data analytics techniques. It also categorizes applications based on value creation and specific topics of application, resulting in four aspects of value creation (observing, monitoring, understanding, predicting, and optimizing) and five application topics (energy efficiency, smart farming, sustainable urban planning, natural disaster management, and other advanced support). In summary, this literature review aims to provide an up-to-date and comprehensive overview of how big data is being used in climate change studies. It addresses the need for current information in this rapidly evolving field and serves as a valuable resource for researchers and practitioners interested in the intersection of big data and climate science.

1.22.2 Paper Link

Access the full paper at https://www.researchgate.net/publication/330831437$_{B}ig_{D}ata_{a}nd_{C}limate_{C}hang$

1.23 Paper 23: A Big Data Guide to Understanding Climate Change: The Case for Theory-Guided Data Science.

Journal/Conference Rank: Q1
Publication Year: 2014
Reference: [?]

1.23.1 Summary

Context: The introduction begins by acknowledging the democratization of data science in the age of the Internet, with the ability to create, access, and analyze large datasets. New algorithms have been developed to autonomously identify patterns in complex data, making data science a mainstream field. Climate Change as a Pressing Issue: It highlights that global climate change is one of the most significant challenges of our time, and there's still much to learn about our planet's physical processes and their implications for climate change and society. Potential of Climate Data: The article suggests that large climate datasets from various sources, including model simulations and satellite observations, can help fill knowledge gaps in climate science. However, it acknowledges the unique complexity of the Earth's climate system. Progress in Climate Science: The article observes that progress in climate science through big data has been slower compared to other fields like biology or advertising, despite the abundance of climate data. Data-Rich Domain: Climate science is described as a data-rich domain in terms of data volume, velocity, and variety. Purpose of the Review: The literature review aims to discuss significant challenges related to mining climate data and emphasizes the importance of

understanding these intricacies. It seeks to equip the next generation of data scientists with the knowledge and tools needed to address the critical challenges posed by climate change.

1.23.2 Paper Link

Access the full paper at https://www.liebertpub.com/doi/full/10.1089/big.2014.0026.

1.24 Paper 31: On the representation of water reservoir storage and operations in large-scale hydrological models: implications on model parameterization and climate change impact assessments

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: [20]

1.24.1 Summary

This study delves into the critical domain of large-scale hydrological modeling, with a specific emphasis on the ramifications of water reservoirs in the upper Mekong River basin. The core points in the text can be summarized as follows: Introduction to Human-Water Interactions: The study initiates by highlighting the profound impact of human interventions on river basins. Human activities, such as modifications to land cover and the construction of water reservoirs (dams), disrupt natural hydrological processes. With rising water and energy consumption, these human-induced alterations are projected to escalate in the future. Significance of Hydrological Models: Hydrological models play a pivotal role in facilitating the sustainable management of water resources while preserving ecosystems and livelihoods. The precision of these models in capturing human-induced changes is fundamental for effective water resource management. Challenges in Addressing Water Reservoirs: The text explores the complexities of integrating water reservoirs into hydrological models. Many existing models were originally designed for studying natural systems and may lack provisions for incorporating reservoirs. Furthermore, data regarding reservoir design and operation are frequently inadequate. Dealing with numerous dams in expansive river basins compounds the challenge. Approaches for Modeling Water Reservoirs: The text delves into various strategies for modeling water reservoirs within hydrological models. One common approach involves excluding reservoirs from streamflow routing models, which limits the models' applicability for downstream water management. Other methods encompass post-processing hydrological model outputs using water management models or optimization algorithms. Direct Representation of Reservoirs: The preferred approach entails directly integrating water storage and operational aspects within hydrological models. This necessitates modifying the model structure and gathering comprehensive information about reservoir design and operational principles. However, this approach is seldom adopted due to its intricacy. Risks of Inadequate Representation: The text raises concerns regarding the risks associated with inadequately representing human-water interactions in hydrological models. It queries whether the calibration process can sufficiently compensate for deficiencies in the model structure and how this might impact the accuracy of parameter assessments. Case Study

in the Upper Mekong Basin: The study focuses on the upper Mekong River basin as a case study. It introduces a computational framework based on the Variable Infiltration Capacity (VIC) model and a multi-objective evolutionary algorithm for model calibration. This framework features a novel VIC variant that enables the simulation of reservoir storage dynamics and operational rules. Results and Implications: The text delves into the findings from experiments utilizing the hydrological model, both with and without reservoirs. Both model variations attain similar levels of modeling accuracy during calibration. Nonetheless, the model without reservoirs attempts to compensate for their absence, resulting in a less precise representation of critical hydrological processes. The study also illustrates the potential repercussions of these issues by applying the models to a climate change impact assessment. This study underscores the critical necessity of accurately representing human-water interactions, especially the role of water reservoirs, within large-scale hydrological models. It accentuates the challenges and risks associated with inadequate representation and employs the upper Mekong River basin as a case study to delve into these issues. This research constitutes a substantial contribution to the field of large-scale hydrological modeling by scrutinizing the influence of water reservoirs on process-based models. This framework introduces an innovative VIC variant to simulate both water storage dynamics and reservoir operations. The case study in the upper Mekong basin serves as a practical application of these methods. The outcomes indicate that both model configurations, whether with or without reservoirs, achieve parallel modeling accuracy during the calibration process. Nevertheless, the absence of reservoir representation leads to unforeseen consequences, affecting the portrayal of vital hydrological processes. The study also elucidates the potential implications of these issues when evaluating the effects of climate change on river discharges. This research underscores the utmost importance of precisely representing water reservoirs in hydrological models to ensure dependable projections and sheds light on how water infrastructure significantly influences modeling outcomes. It also discusses model assumptions and outlines future research directions in the context of human-water interactions and infrastructure. The study acknowledges the support received from the Ministry of Education in Singapore and extends appreciation to the editor and reviewers for their constructive contributions.

1.24.2 Paper Link

Access the full paper at https://hess.copernicus.org/articles/24/397/2020/.

1.25 Paper 32: Meta-analysis on how manure application changes soil organic carbon storage

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [21]

1.25.1 Summary

This literature review addresses the urgent challenge of reducing greenhouse gas (GHG) emissions to combat climate change. It recognizes the complexities associated with transitioning to renewable energy sources and the potential risks linked to carbon capture and storage (CCS) technologies. The study highlights the significance of removing carbon from the atmosphere as a crucial solution. The review emphasizes the pivotal role

of soils as reservoirs for carbon, housing more carbon than terrestrial vegetation and the atmosphere combined. It explores the concept of carbon sequestration, focusing on the long-term storage of organic carbon in soils, which contributes significantly to climate change adaptation and mitigation. Various methods for enhancing soil organic carbon (SOC) are examined, including the use of cover crops and the application of organic materials such as manure. The study investigates the effects of manure application on SOC stocks, taking into account factors like soil characteristics, climate regions, and manure properties. A meta-analysis approach is employed to assess the impacts of manure application on SOC stock changes, utilizing response ratios and mean SOC variances. The findings provide valuable insights into the factors influencing changes in SOC stocks due to manure application, enhancing our understanding of carbon sequestration within soils. This literature review is a comprehensive exploration of the subject, offering essential information for the development of sustainable and effective strategies to mitigate GHG emissions.

1.25.2 Paper Link

Access the full paper at https://www.nature.com/articles/s41598-021-82739-7citeas.

1.26 Paper 33: Internet of Things (IoT) and the Energy Sector

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: [22]

1.26.1 Summary

This paper provides an in-depth exploration of the applications and significance of the Internet of Things (IoT) within the energy sector, with a strong emphasis on improving energy efficiency and fostering the transition to sustainable energy practices. Recognizing the growing global energy demand and its environmental implications, including rising CO2 emissions and global warming, the paper underscores the urgent need for more efficient energy utilization, the integration of renewable energy sources (RESs), and the reduction of energy consumption. The IoT framework and its fundamental technologies, including sensors, communication networks, cloud computing, and data analytics platforms, are introduced as the enabling mechanisms for realizing these energy efficiency goals. IoT connects physical devices, enabling real-time data collection and analysis to optimize processes across the entire energy supply chain, from energy generation and conversion to transmission, distribution, and consumption. Unlike previous studies that often focus on specific energy subsectors or technologies, this paper takes a comprehensive approach, reviewing the role of IoT across various segments of the energy sector. It also delves into the challenges related to IoT implementation, such as energy consumption, integration with energy subsystems, privacy, security, IoT standards, and architectural design, while providing insights into solutions for these challenges. The paper concludes with a discussion of prospects and impediments associated with deploying IoT in the energy sector, along with an outline of emerging trends. It serves as a valuable reference for policymakers, economists, energy specialists, and managers seeking profound insights into the pivotal role of IoT in enhancing energy systems. Furthermore, the paper highlights the importance of foundational IoT technologies, including sensors, actuators, and

communication methods, for optimizing energy consumption and advancing energy management. The integration of IoT into smart grids, buildings, transportation systems, and industrial processes is detailed, showcasing how IoT enhances energy efficiency and sustainability. Moreover, the paper touches on the vital role of cloud and fog computing in processing and analyzing the vast amount of data generated by IoT devices, underlining their contributions to energy management and data processing efficiency. The integration of IoT in smart grids fosters agile demand response mechanisms, real-time pricing tariffs, and a reduction of transmission losses, creating a more efficient and responsive energy distribution system. In buildings, IoT devices optimize HVAC and lighting systems, while in industry, they reduce energy consumption and enable personalized, on-demand production. Finally, intelligent transportation systems, supported by IoT, enhance traffic management, reduce energy consumption, shorten travel times, and mitigate emissions. In summary, this paper offers a comprehensive view of the potential of IoT to revolutionize the energy sector, enhance energy efficiency, and address emerging challenges while promoting a shift towards sustainable energy practices.

1.26.2 Paper Link

Access the full paper at https://www.mdpi.com/1996-1073/13/2/494.

1.27 Paper 34: Smart Farming: Agriculture's Shift from a Labor Intensive to Technology Native Industry

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: [23]

1.27.1 Summary

This research paper explores the intricate dynamics of contemporary agriculture and the role of information technologies in addressing its challenges. These challenges include increasing food production to support a growing global population, dealing with the impacts of climate change, addressing water scarcity, and overcoming economic uncertainties in the farming sector. The paper emphasizes the importance of transitioning to data-driven management and automation as key strategies to meet these challenges.

The article highlights fundamental technologies driving modern agriculture:

1. Internet of Things (IoT): Microsensors in IoT devices play a crucial role in collecting data on agricultural parameters, enabling precise monitoring of environmental conditions and crop health.

2. Networking Technologies: Various networking technologies streamline data transmission from sensors to central systems, offering flexibility in addressing diverse agricultural needs.

3. Cloud and Edge Computing: The fusion of cloud and edge computing enhances data storage, processing, and analysis, tailored to the specific requirements of agricultural applications.

4. Single-Board Microcontrollers and Computers: Devices like the Raspberry Pi democratize technology access, fostering innovative solutions in agriculture.

The paper provides an overview of the current state of these technologies and their practical applications in tackling agricultural challenges, along with insights into ongoing research and development in the field.

In conclusion, the agriculture industry is undergoing a transformation driven by emerging technologies, particularly IoT, networking, and computing solutions. This transformation is essential for boosting productivity, sustainability, and profitability, addressing the needs of a growing global population, and tackling environmental issues. Additionally, the paper discusses wide-area network protocols suited for low data-rate, battery-operated devices in rural and remote areas, alternative technologies like NB-IoT, LoRa, Sigfox, and LTE-M, mesh networks, and the significance of cloud and edge computing. The text also touches upon single-board microcontrollers, application protocols, and the potential for fully automated farms operated by autonomous robots.

1.27.2 Paper Link

Access the full paper at https://sci-hub.ee/10.1016/j.iot.2019.100142.

1.28 Paper 35: Smart farming for improving agricultural management

Journal/Conference Rank: Q2
Publication Year: 2021
Reference: [24]

1.28.1 Summary

This research paper delves into the challenges posed by food shortages and population growth in the context of sustainable development. It spotlights advanced technologies like artificial intelligence (AI), the Internet of Things (IoT), and mobile internet as critical solutions, with a specific focus on smart farming from 2019 to 2021.

The paper thoroughly explores the realm of smart farming, encompassing data collection, transmission, storage, and analysis. It underscores the pivotal role of IoT in smart farming, linking sensor devices to perform diverse tasks. Examples include smart irrigation systems that monitor water levels, climate conditions, and irrigation efficiency. The integration of unmanned aerial vehicles (UAVs) and robots for tasks like harvesting, weed detection, and livestock management is detailed, with a strong emphasis on real-time data processing aided by AI, deep learning, and machine learning.

Additionally, the paper underscores the significance of 5G mobile networks in powering smart systems, offering rapid data transfer and support for numerous connected devices per square kilometer. While recognizing the challenges facing smart farming in developing countries, the paper outlines approaches and solutions within this context. It underscores the importance of Smart Decision Support Systems (SDSS) for real-time analysis and decision management and calls for greater support from governments and the private sector in these regions.

In sum, this paper provides valuable insights into the pivotal role of technology, particularly IoT and 5G networks, in revolutionizing agriculture to address global challenges related to food production and sustainability.

1.28.2 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S1110982321000582.

2 System Design

2.1 To Be Rich Picture

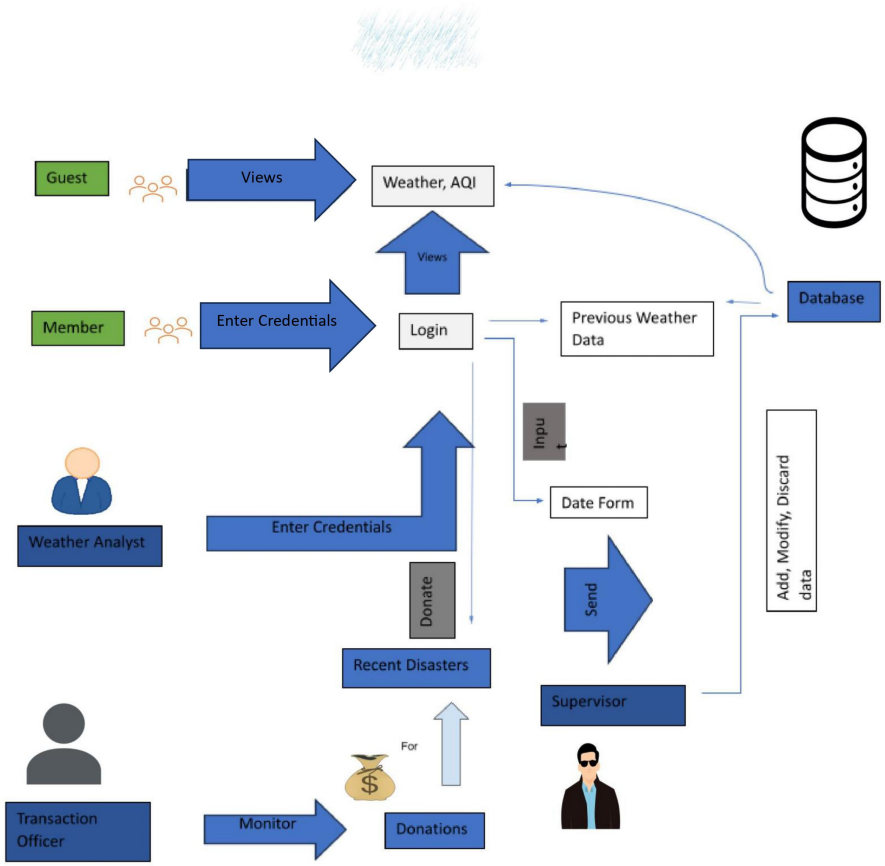

Figure 8: To be rich picture for our proposed system.

2.2 As is Rich Picture

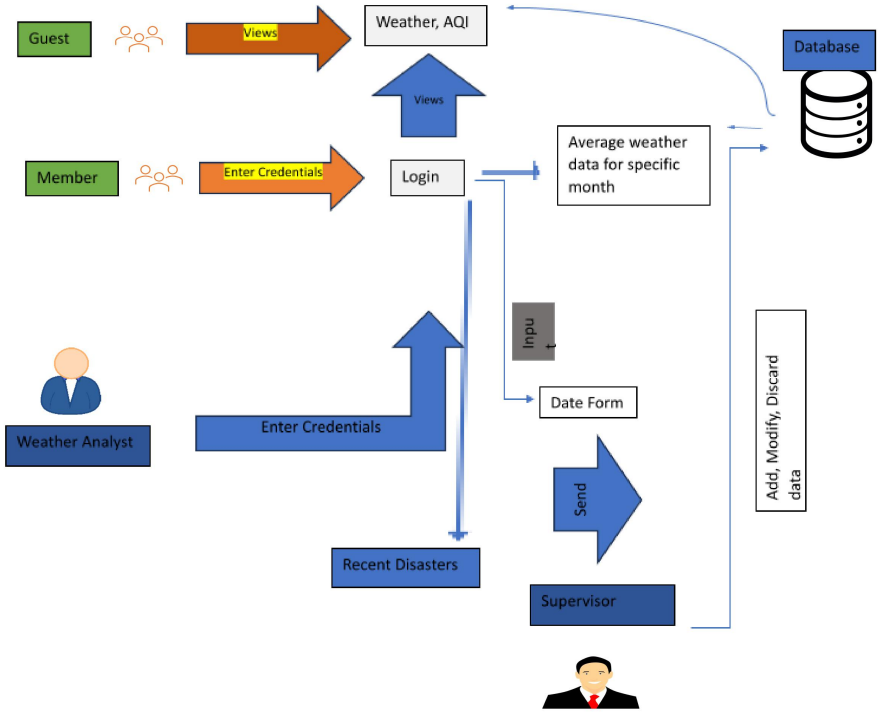

Figure 9: As is rich picture for our proposed system.

2.3 Entity Relationship Diagram

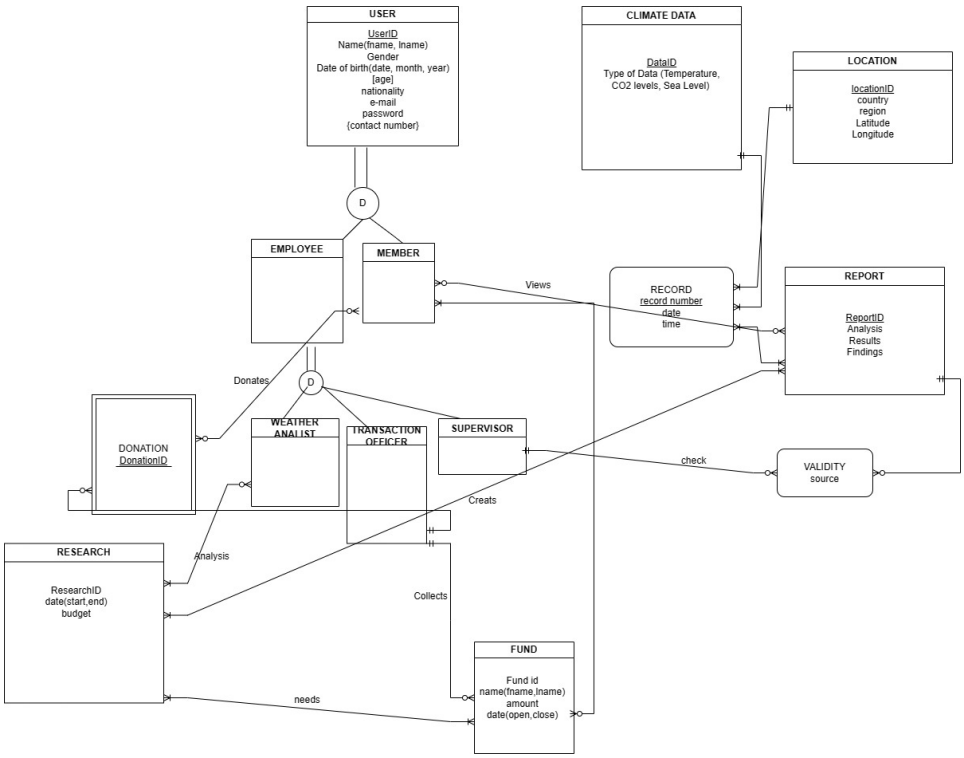

Figure 10: ERD for our proposed system.

2.4 Schema

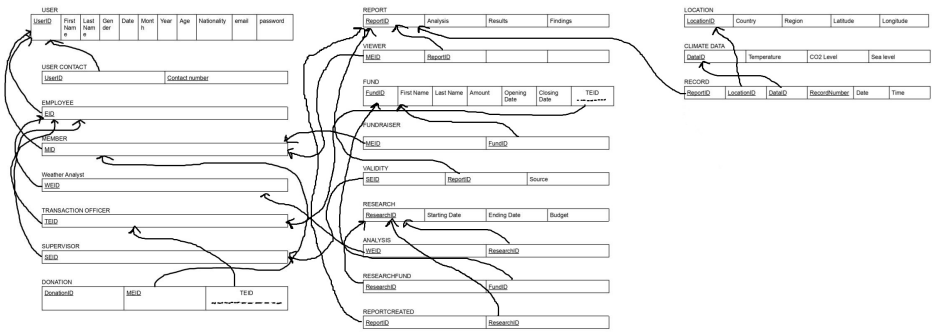

Figure 11: Schema for our proposed system.

2.5 Normalized Schema

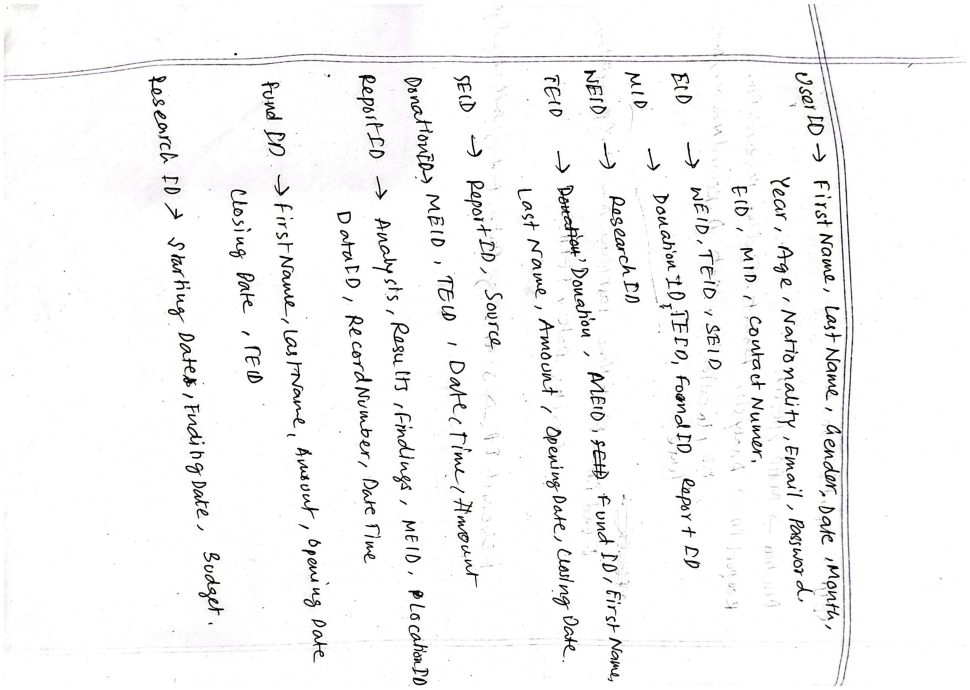

Figure 12: Normalized Schema for our proposed system.

2.6 Data Dictionary

USER

Name	Data Type	Size	Remark
userID	Integer	6(assuming the format is "202856")	This is the primary key.This contains ID of user.This is unique.
fname	String	Depends on the maximum length of the first name.	First name of the user
lname	string	Depends on the maximum length of the last name	Last name of the user
gender	string		Gender of user.Example:male
Date	Integer (1-31)	2	Birthdate of the user
Month	Integer (1-12)	2	BirthMonth of the user
Year	Integer	4	BirthYear of the user
age	Integer	2	calculated based on the Date of Birth
nationality	String		Nationality of user
email	String	Maximum number of characters allowed	whether the email must be unique.

USER CONTACT

Name	Data Type	Size	Remark
userID	Integer	6	This is part of composite primary and foreign key in this relation.foreign key from user table.
Contact number	Integer		This is part of composite primary key in this relation .

EMPLOYEE

Name	Data Type	Size	Remark
EID	Integer	6	This is primary key.Also it is foreign key from USER table.

Figure 13: Data dictionary Part 1 for our proposed system.

MEMBER

Name	Data Type	Size	Remark
MID	Integer	6	This is primary key.Also it is foreign key from USER table.

WEATHER ANALIST

Name	Data Type	Size	Remark
WEID	Integer	6	This is primary key.Also it is foreign key from EMPLOYEE table.

TRANSACTION OFFICER

Name	Data Type	Size	Remark
TEID	Integer	6	This is primary key.Also it is foreign key from EMPLOYEE table.

SUPERVISOR

Name	Data Type	Size	Remark
SEID	Integer	6	This is primary key.Also it is foreign key from EMPLOYEE table.

DONATION

Name	Data Type	Size	Remark
DonationID	Integer	7	This is part of composite primary key .but it is dependent attribute.
DonorName	string	Maximum number of characters allowed	Name of donor
date	Interger	10 (assuming the format is "YYYY-MM-DD")	Which date donate
time	String	8(assuming the format is "01:30-pm")	When time donate

Figure 14: Data dictionary Part 2 for our proposed system.

amount	string	Maximum number of characters allowed	
TEID	Integer	6	This is part of composite primary key .Becasuse DonateID is dependent key.Also TEID is foreign key from TEID table.

DONATION-MEMBER

Name	Data Type	Size	Remark
DonationID	Integer	7	This is is part of composite primary key of this relation.this is also foreign key from DONATION Table.
MID	Integer	6	This is part of composite primary key of this relation.Also it is foreign key from MEMBER table.

REPORT

Name	Data Type	Size	Remark
ReportID	String	7(assuming the format is "RP-2453")	This is unique and primary key.
Analysis	String	Maximum number of characters allowed	Contains analysis
Result	String	Maximum number of characters allowed	Contain results
Finding	String	Maximum number of characters allowed	Contains finding

VIEWER

Name	Data Type	Size	Remark
MID	Integert	6	This is part of composite primary key of this relation.Also it is foreign key from MEMBER table.

Figure 15: Data dictionary Part 3 for our proposed system.

ReportID	String	7	This is part of composite primary key of this relation.Also it is foreign key from REPORT table.

FUND

Name	Data Type	Size	Remark
FundID	String	7(assuming the format is "FD-2453")	This is unique and primary key.
First name	String	Maximum number of characters allowed	Contains first name
Last name	String	Maximum number of characters allowed	Contains last name
Amount	String	Maximum number of characters allowed	Contains amount
Opening date	string	10 (assuming the format is "YYYY-MM-DD")	Contains date
Closing date	string	10 (assuming the format is "YYYY-MM-DD")	Contains date
TEID	Integer	6	This is foreign key from TRANSACTION OFFICER table.

FUNDRAISER

Name	Data Type	Size	Remark
MID	Integert	6	This is part of composite primary key of this relation.Also it is foreign key from MEMBER table.
FundID	String	7	This is part of composite primary key of this relation.Also it is foreign key from FUND table.

Figure 16: Data dictionary Part 4 for our proposed system.

VALIDITY

Name	Data Type	Size	Remark
SEID	Integert	6	This is part of composite primary key of this relation.Also it is foreign key from SUPERVISOR table.
ReportID	String	7	This is part of composite primary key of this relation.Also it is foreign key from REPORT table.
source	string	Maximum number of characters allowed	Contains sources

RESEARCH

Name	Data Type	Size	Remark
ResearchID	String	7(assuming the format is "RS-2453")	This is unique and primary key.
starting date	string	10 (assuming the format is "YYYY-MM-DD")	Contains date
ending date	string	10 (assuming the format is "YYYY-MM-DD")	Contains date
Budget	string	Maximum number of characters allowed	Contains budget

ANALYSIS

Name	Data Type	Size	Remark
WEID	Integert	6	This is part of composite primary key of this relation.Also it is foreign key from WEATHER ANALIST table.
ResearchID	String	7	This is part of composite primary key of this relation.Also it is

Figure 17: Data dictionary Part 5 for our proposed system.

			foreign key from RESEARCH table.

RESEARCHFUND

Name	Data Type	Size	Remark
ResearchID	String	7	This is part of composite primary key of this relation.Also it is foreign key from RESEARCH table.
FundID	String	7	This is part of composite primary key of this relation.Also it is foreign key from FUND table.

REPORTCREATED

Name	Data Type	Size	Remark
ResearchID	String	7	This is part of composite primary key of this relation.Also it is foreign key from RESEARCH table.
ReportID	String	7	This is part of composite primary key of this relation.Also it is foreign key from REPORT table.

LOCATION

Name	Data Type	Size	Remark
LocationID	string	7(assuming the format is "LO-2453")	This is unique and primary key.
country	string		

Figure 18: Data dictionary Part 6 for our proposed system.

region	string		
Latitude	string		
Longitude	string		

CLIMATEDATA

Name	Data Type	Size	Remark
DataID	string	7(assuming the format is "DT-2453")	This is unique and primary key.
Temperature	string		
CO2 Level	string		
Sea level	string		

RECORD

Name	Data Type	Size	Remark
LocationID	String	7	This is part of composite primary key of this relation.Also it is foreign key from LOCATION table.
ReportID	String	7	This is part of composite primary key of this relation.Also it is foreign key from REPORT table.
DataID	String	7	This is part of composite primary key of this relation.Also it is foreign key from CLIMATEDATA table.
RecordNumber	integer		
date	Interger	10 (assuming the format is "YYYY-MM-DD")	
time	String	8(assuming the format is "01:30-pm")	

Figure 19: Data dictionary Part 7 for our proposed system.

3 Methodology and Implementation

3.1 Frameworks and Softwares

We used html and css to design our user interface. We used JavaScript to implement backend functions of our system. We used php and Xampp to connect our database to our backend and frontend.

3.2 Interface Design and Implementation

3.2.1 Support

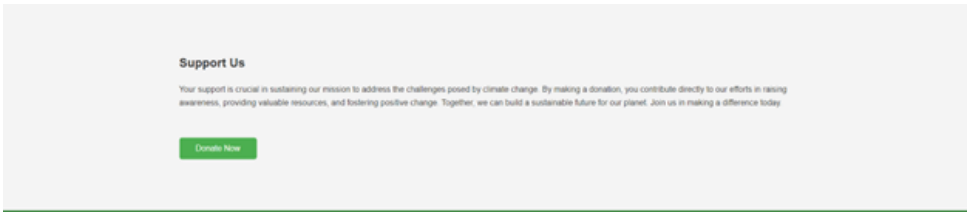

Figure 20: Home interface.

The support button redirects the end user to the donation page of the website where the end user can donate us and other NGOs through us to help the needy people. In the page we have the links of the NGOs that are connected to us and the donation button pops up a form which the user has to input data from which only the transaction will be stored in our database.

3.2.2 Contact

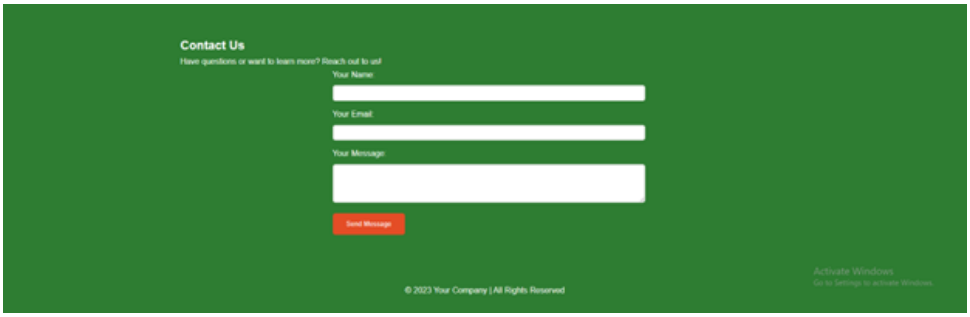

Figure 21: Home interface.

The contact button redirects the user to the contact us interface in this interface the user can interact with us through messages if they have any kind of queries or its for us they can share it to share their information first of all the have to input their name and their email address and type the message in the message box below and send message which will be stored in our database.

3.2.3 News

Figure 22: Home interface.

This interface shows US the recent events around the world regarding climate change. The interface shows local International disaster news NGO promotion and recent research for the climate change and the impacts of it the see more button in the interface redirects to individual reliable news portals.

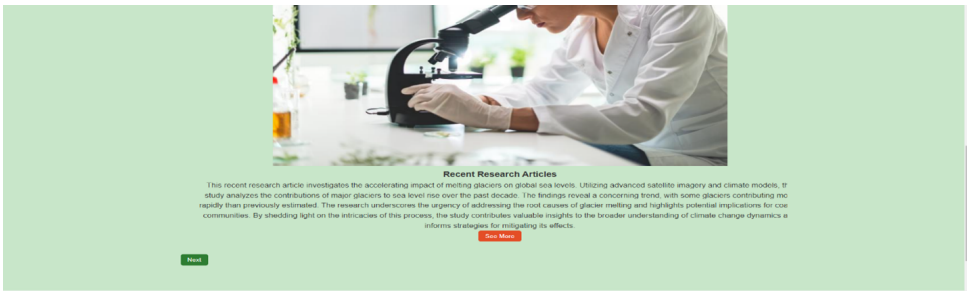

Figure 23: Home interface.

3.2.4 Donation interface

Figure 24: Home interface.

This interface is used by users to donate to certain social causes. Users will input their full name, email, donation amount, donation towards, payment method, nagad/bkash/credit number. Once user clicks submit donation button, donation will be submitted and entity will be added to donation database.

3.2.5 Landing page

Login

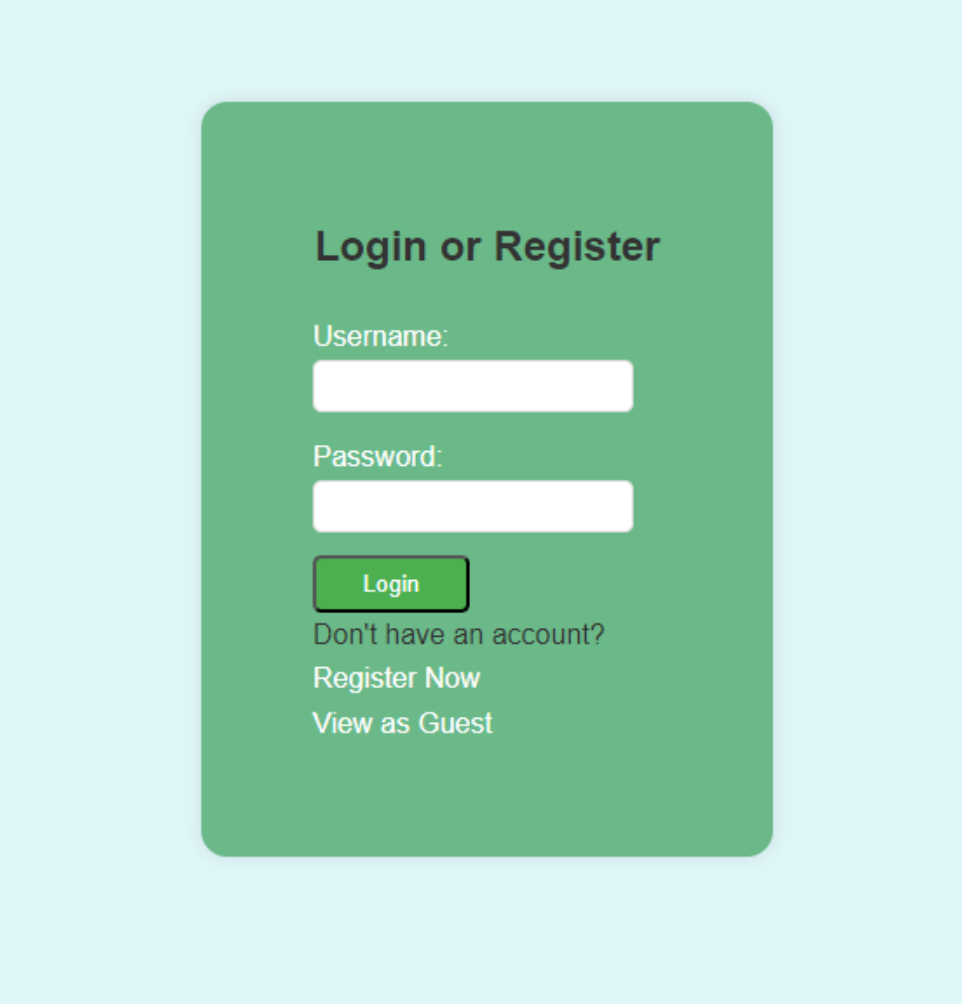

Figure 25: Login interface.

This is the first interface of our website and it is a login or register page basically and end user will have to input the username and password to get into the website and a new and user will have to register to log in to the website in putting the correct registered username and password and clicking the login button will enable the access to the website.

Register

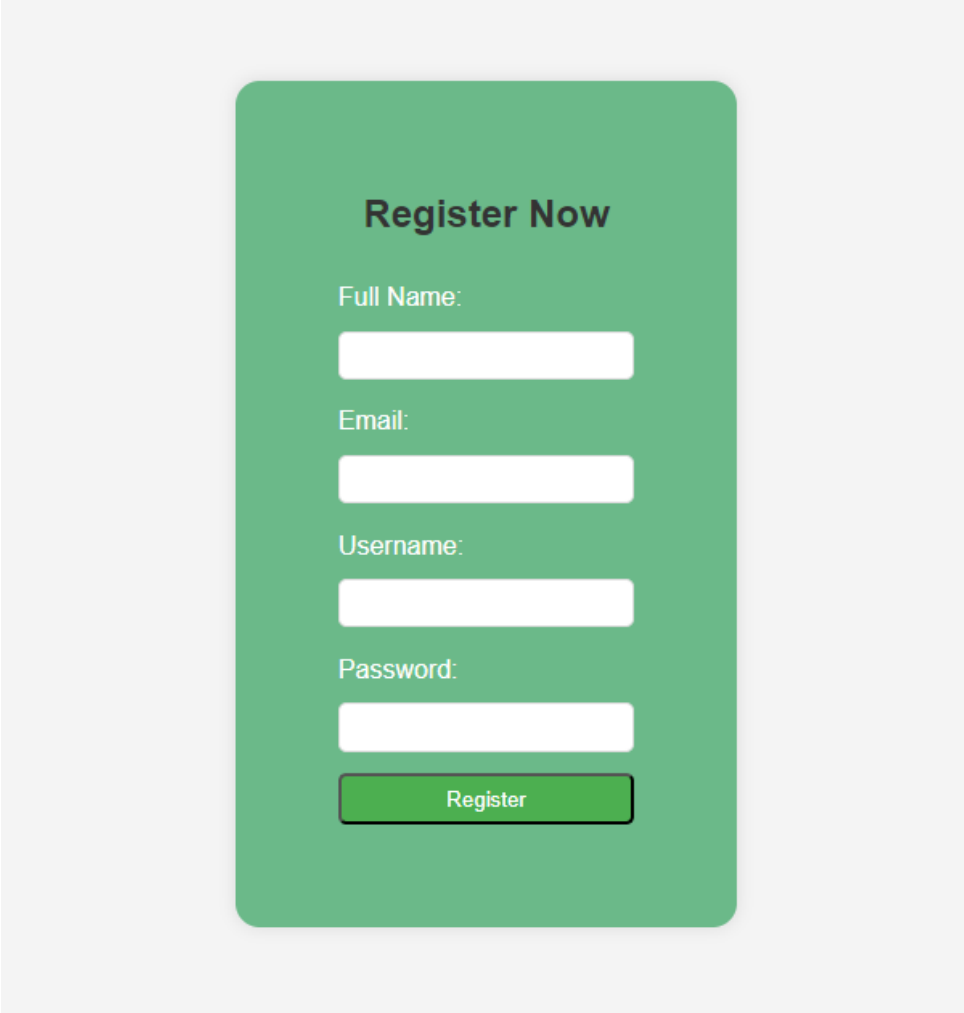

Figure 26: Register interface.

This interface is used to register new users. Users will input their name, email, username, password. Once users click register, they will become a user and can login to the website.

Logout

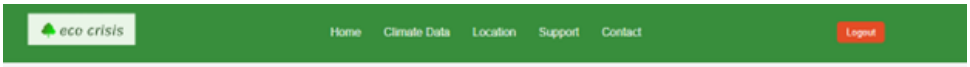

Figure 27: Logout interface.

Clicking the logout button from the dashboard will get the user out of the website to the login interface.

3.2.6 Dashboard

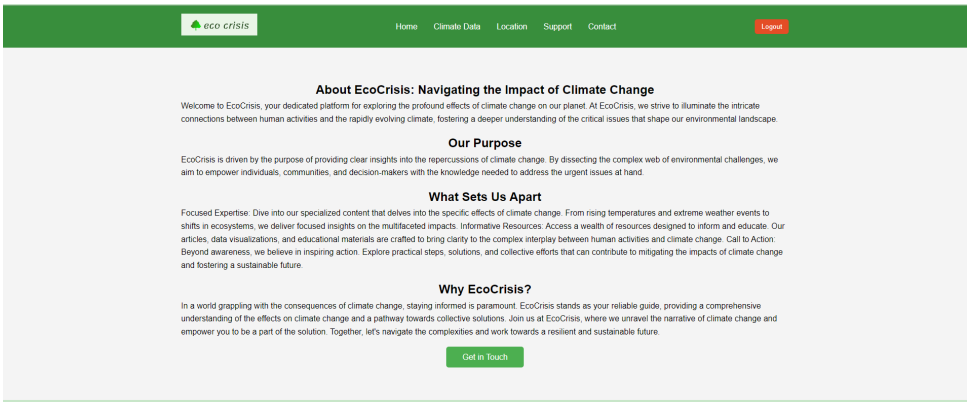

Figure 28: Home interface.

This is the homepage of our website after login in. The homepage consists the description of our website and our work and it has several buttons which work as dash board and takes us up to different locations of our website each and every single button is interactive. The home button takes us to the home interface which is on the picture. This interface describes our goals and ourselves to the end user. If the end user clicks on the home button, then it will take us here and the get in touch button beneath the description with take the end user to our contact page. The climate data button will redirect the user to our main database page where we have the data and charts about our climate and weather since the last 50 years. The location button redirects the user to an interface where they can input any city name and watch the live weather condition of that city.

4 Result Analysis

4.1 Data Source

We obtained weather data primarily from www.visualcrossing.com, which offers a free tier with limitations. The chosen source provided historical weather data for Dhaka spanning the last 5 years and for Chittagong, Sylhet, Rajshahi, Khulna, and Barishal for the last 1 year.

The choice of www.visualcrossing.com was influenced by the availability of a free account, but it came with constraints. The free account allowed access to weather data for only 1000 days per day, imposing limitations on the comprehensiveness of the dataset.

4.2 Data Analysis

Despite the limitations imposed by the free account, the quality of the data was deemed satisfactory for preliminary analysis. However, it's essential to acknowledge potential biases introduced due to the restricted dataset size.

Comparing weather data across different cities revealed regional disparities in climate patterns. These disparities may have implications for local climate change impacts and adaptation strategies.

5 Conclusion and Future Planning

The analysis of historical weather data provides valuable insights into the local impacts of climate change. Identified trends and patterns serve as indicators of climate variability and potential long-term changes.

The analysis of weather data from www.visualcrossing.com has yielded valuable insights into climate trends in Dhaka over the last 5 years and other major cities in Bangladesh over the last year. Despite limitations associated with the free account, the data has provided a foundation for understanding regional climate patterns and their potential implications for climate change.

To address limitations in dataset size and account restrictions, future efforts should explore diverse sources of weather data. This includes evaluating paid sources or seeking collaborations with meteorological institutions for broader and more comprehensive datasets.

Measures should be taken to ensure data validation and quality assurance to enhance the reliability of findings. This may involve cross-referencing data from multiple sources to ensure accuracy and completeness.

User feedback should be encouraged on the website to aid future improvements. This will help make the ux better and address issues with the website to enhance usability of the application.

Long-term plans should be considered for continuous data collection to monitor climate trends over extended periods. Establishing a reliable and sustainable data collection mechanism is essential for ongoing research and analysis.This result analysis sets the foundation for understanding the climate dynamics in the selected regions and provides a roadmap for refining the data collection process and analysis methodologies in the future.

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