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Zero C

Abstract:

Global warming is causing a massive problem. there's a pressing need to find a solution. For this reason, in this paper, we will introduce our application "Zero c". Zero c is a carbon tracking application that utilizes Blockchain technology and emphasizes the benefits of preferring blockchain technology over other technologies. In addition to blockchain technology, several other technologies are implemented like sensors (IoT devices), databases, etc. The application will offer real-time tracking of carbon emissions and will deliver detailed visualized information to the users about their carbon consumption. The collaboration with environmental organizations helped to create a stronger social impact. In this paper, we are also highlighting the various social impacts that we will get from this application, from health, and economic, to environmental. A lot of people say that technology is harming the environment, but with our application, we prove the opposite.

Keywords: Carbon footprint; carbon tracking; blockchain technology; IoT; carbon emission.

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Introduction:

In today's world, We are experiencing rapid advancements in technology and we are encountering a lot of changes in our lives, world, and environment. Along with this advancement, a lot of environmental problems arise and greenhouse emissions that are intensifying the climate change. For this reason, an urgent response is needed to control the carbon emission and reduce the effects of harmful emissions on the environment. A carbon tracking system is one of the proposed systems to tackle our activities and provide us with detailed analysis of our carbon emission. According to Zhang et al and Dong et al carbon emission trading policy was successful in reducing carbon emissions [1]. Despite this fact, implementing this system can be challenging due to many reasons like the accuracy of these systems, giving out the permits process, and manipulations in data from users or companies.

A strong technical tool is needed in this situation. Digging deeper into technical solutions that we currently have. Blockchain technology seems the best when it comes to carbon emission trading. What makes technology unique is that it will allow us guarantee the transparency of the entire process and make the received data trustworthy. Receiving transparent and real data will help us to generate real outcomes. Additionally, Through using the blockchain technology with privacy computing, data can be verified and used securely. Blockchain technology brings us hope to eliminate carbon data falsification and illegal carbon trading. For this reason, blockchain technology is currently recognized as the best tool to achieve energy sustainability [2].

Project Background:

Introducing **Zero C** : A Carbon Tracking and Trading App , a game-changing solution at the crossroads of technology and sustainability. As concerns about carbon emissions and their environmental impact mount, our effort shines as a sign of hope.With an ever-increasing carbon footprint contributing to the impending climate disaster, there is an urgent need for creative tools that enable individuals to take concrete steps towards a greener future.

Zero c is an app designed mainly to track carbon emissions from users using high efficiency sensors and IoT devices , this app can track users carbon usage and visualize it hourly , daily and even monthly . According to the collected data , the app will infer either the consumption has decreased or increased . In this case users can gain gift cards or coins that can be traded through many crypto platforms . So , mainly . Our app not only offers an eco-friendly solution but also provides an opportunity to earn money and decrease poverty .

Zero C is created to send an automated alert when the user exceeds a certain rate of carbon consumption; the user can also get a coin deduction if his consumption has reached a high average .

Our app addresses the critical issue of carbon emissions. Despite the urgency, individuals lack easily available methods for efficiently monitoring and reducing their carbon impact. Existing solutions fall short in terms of delivering real-time tracking and personalized advice. Our app is built to be an environmental organization of stewardship , transparency and innovation , we believe that collaboration is the only solution to combat climate change

In the pursuit of forging impactful collaborations, We've found possible collaborators who share our app's objective. Environmental non-governmental organizations (NGOs) like EarthGuard Alliance and corporate sustainability leaders like EcoCorp Solutions provide channels for lobbying and awareness. Collaborations with creative businesses such as CarbonTech Labs and educational organizations such as the EcoEd Institute can help to foster technology innovation and education. Partnerships with local governments, carbon offset organizations, renewable energy suppliers, and wellness brands may also broaden our reach and increase the effect of our app. We foresee a collaborative effort to achieve a more sustainable future through these collaborations.

Another conceivable path for collaboration is to work with organizations that can improve the user experience by giving appealing rewards for eco-friendly behaviors such as : EcoRewards Exchange ,GreenCommerce Hub , ClimateCoin Marketplace and last CarbonOffset Marketplace.

Social issues:

Carbon emissions not only Impose unrepairable environmental damage, but also have significant economic and social effects.

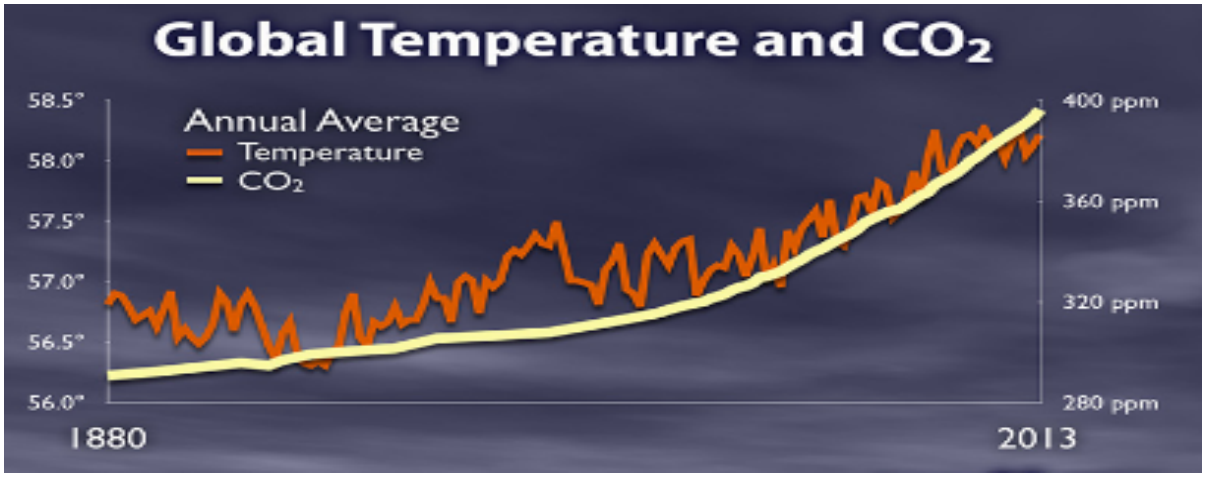
Marshall Burke and Lawrence Goulder of Stanford University discussed the social effect of carbon emissions, stating that the social cost of carbon is the cost of the damages caused by one more tonne of carbon dioxide emissions. To put it another way, When we emit a ton of carbon dioxide in the atmosphere, it sticks around for a while and causes warming, affecting human outcomes. The social cost of carbon is the total damage that an additional ton of CO2 has on outcomes, converted into dollars.
When calculating the social cost of carbon, the main components are what happens to the climate and how these changes affect economic outcomes, including changes in agricultural productivity, damages caused by sea level rise, and decline in human health and labor productivity

Carbon emissions have a crucial impact on physical and psychological health. Carbon emissions contain carcinogens which increase the risk of getting cancer. Experts have pointed out that about half of cancer illnesses are related to outdoor pollution from vehicles and industries. People with diabetes who live near areas with fog and carbon emissions have high mortality rates resulting from heart diseases.

Furthermore, awareness of the effects of climate change can cause climate anxiety, grief over environmental losses, and a broken sense of place and identity. Climate-related events cause emotional stress in individuals and communities

Carbon emission does not only destroy the health and psychology but also the weather, according to NASA. Catastrophic weather events caused $1 billion in damage in the United States during 2012. Storms like 2012's Hurricane Sandy and 2013's Typhoon Haiyan are becoming more frequent, and the devastation they cause takes local communities years to remedy, often with the help of international aid. The storms themselves and the damage to infrastructure they cause often result in a tremendous loss of human life , including disease transmitted when water and sewer systems are not working properly.

Add to that , Changes in the weather affect the agricultural industry and the human food supply. Carbon emissions contribute to increasing temperatures and decreasing precipitation, changing the growing conditions for food crops in many areas.



Increasing temperatures cause an increase in global water temperature. Algae are sensitive to water temperature increases. When temperatures rise, algae die. Small fish depend on algae as a food source. Without an abundant supply of algae, small fish die or move to another location. Small fish are a direct source of food for larger fish; thus warming waters cause a ripple effect in the food chain,

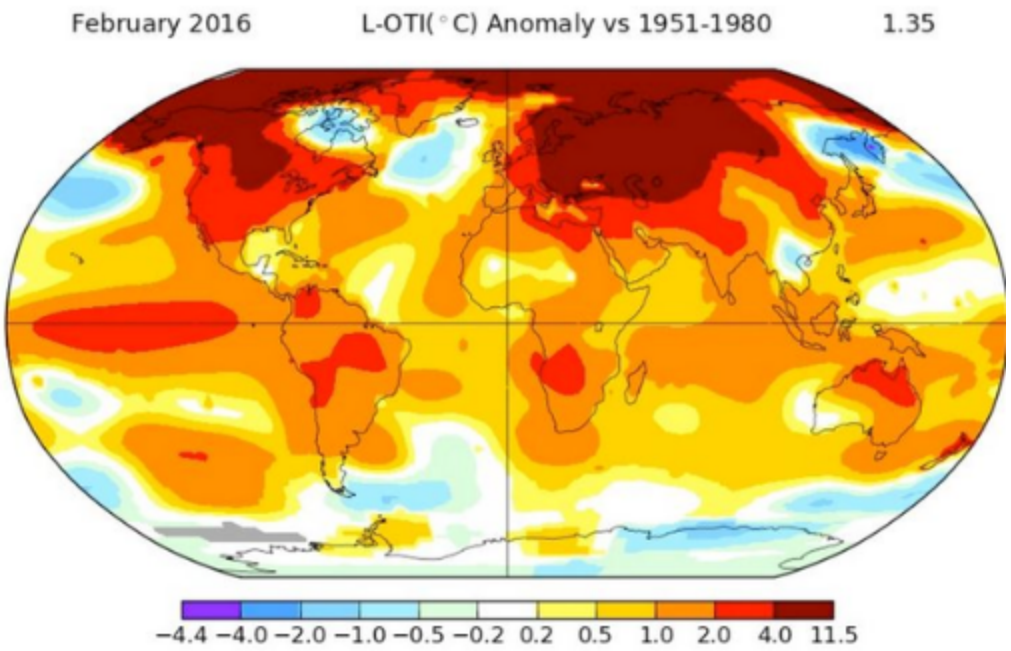
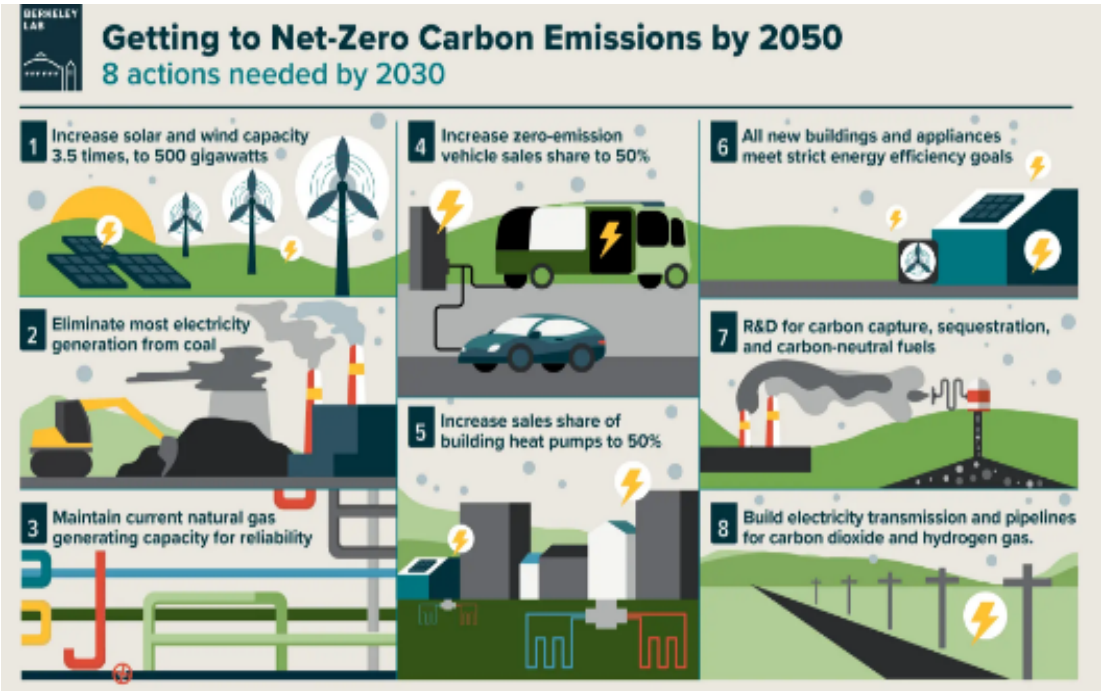


Figure 2. Anomalies [departures from average] in surface temperature across the globe for February 2016, in degrees Centigrade, as analyzed by NASA's Goddard Institute for Space Studies. Image credit: NASA/GISS.

Solving these problems requires a multibranched path . First , utilizing renewable energy such as solar , wind instead of fossil fuels , also changing transportation routines , utilizing electric cars , bikes can lower carbon emissions . Promoting public awareness , establishing reforestation campaigns play a crucial role . Create a policy that measures and limits carbon emissions



Solutions By using IT:

The implementation of the carbon Tracker system requires a detailed plan that will allow us to create a complete and efficient carbon tracking system. In the paragraph, I'll explain briefly how such a system can be implemented.

1- Database Management system:

Building a database comes at the beginning of the process. Database management system is essentially a computerized data- keeping system [6]. It contains a set of related table spaces and index spaces [6]. Using a database server like MySQL, PostgreSQL, or Microsoft SQL Server can allow us to store structured data, such as emission records, user information, and historical data.

Estimated time and cost:

The estimated time for preparing the Database system can be estimated as 1 month or less. On the other hand, The price of the software tools and licenses would range around 1000$. In addition to database administrator yearly salary that is estimated between 50,000$ and 70,000$.

2- Data connection and integration:

The next step of the implementation process is about collecting data. This step will also require us to build a detailed plan that guides us to collect data and what technologies we need in this process. In this step, we will begin by implementing sensors (IoT devices) that will allow us to gather data from the physical world. These sensors should be embedded in places where we want to collect data. Since we are collecting data about carbon emission, we would have to embed these devices in cars for example, if we would just like to specify, it can be also embedded in factories and many places. After the data collection process from the sensors, the raw data collected might still need preprocessing before integration. Afterward, Integration platforms come in the next step. integration platforms play a crucial role in collecting and transforming the data into a common format.

Estimated time and cost:

For this step we will need an IoT specialist in addition to several developers to integrate the data and set up the platform. The average salary of the IoT specialists is around 86,000$ a year. Meanwhile, developers' salaries would range from $70k to $90k a year. The estimation time for implementing this system would depend on how complicated the application is. The time estimation for basic implementation that would just track the user carbon emission would take around 2 to 3 months.

3- Blockchain technology:

Blockchain technology is simply a network of computers or nodes that share the same transaction history[7]. Due to its transparent and open nature it will help us to overcome many security concerns and illegal operations. However, the implementation of this technology can be pretty complex. Explaining it briefly, Blockchain involves three basic components: transaction,

block, and chain[8]. Transaction is an action that changes the in the ledger, this change can mean transferring assets, updating information, or executing a smart contract. Transaction concepts allow us to validate data. After checking the validity of data, it can become part of the next block in the chain. The Block in the blockchain serves as a container for the validated data. It doesn't only include the transaction, but also saves references to the previous blocks. Once the block is full, information is run through an encryption algorithm that creates hash (hexadecimal number) [9]. Then comes the chain concept which encrypts the hash with the other information in the block [9]. This in return, creates a sequence of blocks that are linked together. The blocks are linked in chronological order which allow to form an unbroken history of all transactions that help the participants to verify the entire history of the ledger. The programming languages used will depend on the blockchain platform that's used.

Estimated time and cost: Blockchain developers must have a good experience in one of the blockchain platforms. The estimated cost for a blockchain developer salary is $120k per year. In addition there will be the blockchain platform fee which is estimated to be around $2000. The implementation of the technology might approximately take 5 to 6 months.

4- User Interfaces and Visualization:

It's the process of creating a user friendly interface that allows stakeholders to interact on it. The interference can be a web page or an application interface. Many tools and frameworks can be used in this level like: React, Angular, or D3.js, Chart.js.

Estimated time and cost: This step will require UI/UX designers in addition to frontend developers. The average salary of the designers is estimated at $80k. Meanwhile, the average salary for front end developers is $92k per year. The estimated time to build the interface is 2 to 3 months.

5- Security and privacy:

securing the app is a fundamental step in any project. Many encryption tools can be used. That's in addition to using access control tools to specify user authentication and authorization to ensure data access is limited to authorized users.

Estimated time and cost: To ensure the security of the application we need to deploy a cybersecurity expert and some access control tools. The average salary for a cybersecurity expert is $119k per year.

Social Impact:

Carbon tracking and trading app "Zero C" have the potential to bring about changes in our efforts to combat climate change. These innovative tools provide an approach to address the

issue of carbon emissions allowing individuals, businesses and governments to collaboratively take actions that benefit both the environment and the global community.

At the Individual level, these applications play a role in promoting environmental awareness and consciousness. They offer people insight into their carbon footprint, which represents the amount of greenhouse gasses produced as a result of their daily activities and lifestyle choices. Equipped with this knowledge, individuals can make informed decisions to reduce their environmental impact. Whether it's opting for transportation, adopting energy technologies or making sustainable consumption choices, these apps empower individuals to actively contribute towards reducing carbon emissions. By integrating carbon tracking apps into their lives people can tangibly observe the impact of their changes fostering a sense of responsibility and commitment to sustainable living.

In the business field, carbon tracking and trading apps “Zero C” provide businesses with tools to enhance their stewardship. These apps enable enterprises to conduct carbon audits, across their operations, supply chains, and production processes. This level of transparency not assists in identifying areas with emissions but also lays the groundwork for developing impactful strategies to reduce emissions. With data, at their disposal businesses can implement energy-saving practices, embrace technologies and optimize resource utilization. In addition, to the benefits these apps provide opportunities for businesses to participate in carbon trading markets. Companies that exceed their emission reduction targets can sell their "carbon credits" to entities that have surpassed their allocated limits. This system creates an incentive for companies to adopt practices while fostering an environment of innovation and competitive advantage.

Furthermore, governments and regulatory bodies can benefit from implementing these apps. Carbon tracking and trading apps offer real-time access to emissions data, allowing authorities to monitor and ensure compliance with emissions regulations and targets. This increased transparency promotes accountability and facilitates collaboration between the private sectors in addressing climate change. By aligning policies with carbon tracking technologies, authorities can promote a sustainable business ecosystem while advancing climate goals.

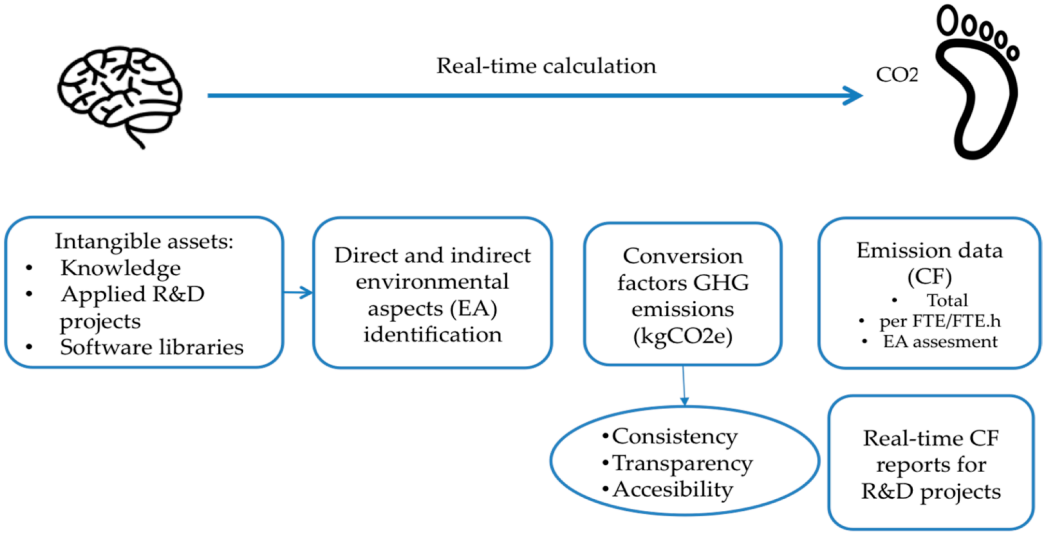
The widespread adoption of carbon tracking and trading apps contributes to outcomes as a whole. Primarily these apps encourage changes by demonstrating how individual actions impact the environment. Such empowerment creates an effect that fosters a commitment to making sustainable choices. Additionally, the wide usage of these apps drives advancements in technologies by increasing investments in renewable energy, energy efficiency and carbon capture solutions. As companies adapt to the growing demand for eco products and sustainable practices the shift towards a low-carbon economy is gaining traction.

On a level the potential impact of carbon tracking and trading apps is significant. Decreasing greenhouse gas emissions leads to air quality and environmental improvements, decreases health risks linked to pollution, along with the rate of climate change effects are benefits. Additionally,

the thriving carbon trading markets stimulate development by nurturing industries and generating new employment prospects.

Potential Social Innovation:

An essential first step in combating climate change is the creation of a reliable and user-friendly carbon emission tracker. A possible social innovation concept for a carbon emission tracker is as follows:

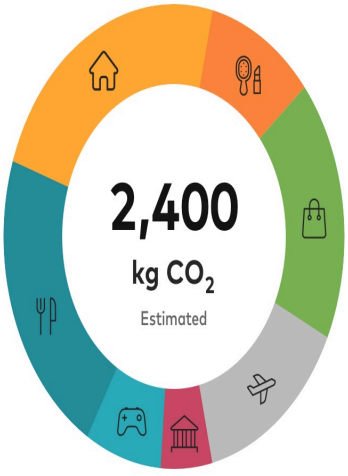


Idea: Gamified Carbon Emission Tracker App

The goal of the mobile app is to make tracking and lowering carbon emissions fun. The app might incorporate learning, competitiveness, and social interaction components to motivate people and communities to make significant efforts to lessen their carbon impact.

Features:

Personal Carbon Footprint Calculator The app might include a simple-to-use carbon footprint calculator that considers a number of variables, including travel, energy use, nutrition, and way of life. Users would enter their information, and the app would calculate their estimated carbon emissions.



Goal Setting and Tracking Users can establish personal targets for reducing their carbon footprint and monitor their development over time. The app might offer incentives or accomplishments for attaining milestones and suggest realistic goals.

Virtual incentives Based on users' accomplishments in reducing their carbon footprint, gamification components like badges, levels, and virtual incentives could be offered to them. These incentives might be connected to actual behaviors like cutting back on driving, switching to a plant-based diet, or taking the bus or train.

Community Challenges Users could take part in challenges that are open to the entire community and that promote teamwork in the reduction of carbon emissions. These contests may include things like "Car-Free Week" and "Energy-Efficient Home Makeover," and they would encourage teamwork and friendly competition.

Social networking and sharing The app might let users connect with friends, family, and other people who share their interests in order to share their progress and support one another. Social components can include exchanging advice, success stories, and even comparing one another's accomplishments in reducing carbon emissions.

Educational Content The app might provide a multitude of instructional materials, such as articles, videos, and infographics, explaining how different activities affect carbon emissions. Users may be able to make better decisions with the help of this information.

Real-World Impact Tracking To make the experience more relatable, the app might display the overall effects of users' actions, such as the quantity of CO2 emissions that were cut, the equal number of trees that were planted, or the number of vehicles that were removed off the road.

Collaboration and Partnerships Partner with companies, regional administrations, and environmental groups to provide incentives to users who accomplish considerable savings. Users might, for instance, earn carbon offset credits or discounts at eco-friendly businesses.

Continuous Improvement Updates to apps on a regular basis may include new features, challenges, and enhancements in response to user input and developing sustainability standards.

Benefits:

Behavioral Change The gamified strategy can encourage people to develop more environmentally friendly routines and actively contribute to lowering their carbon footprint.

Education By making sure users are aware of the effects of their behavior, the app's instructional content encourages a stronger commitment to change.

Community Engagement The app can increase the impact of individual acts and motivate group efforts by generating a sense of community and competition.

Data collection Researchers and policymakers working on carbon reduction measures may find it helpful to analyze aggregated data from user actions.

Scalability The application has the potential to grow significantly and reach a large audience while significantly reducing carbon footprints.

Conclusion:

In conclusion, the development of this app named "Zero C" for tracking and trading carbon has the potential to make an impact on our environmental preservation efforts. This innovative solution is a response to the pressing issues we face today. It goes beyond being a tool; it aims to inspire people to use energy more consciously and be aware of their ecological footprint.

This app holds promise for society as it empowers individuals to visualize their carbon emissions and encourages them to adopt eco-friendly lifestyles. The concept of trading carbon credits is particularly intriguing as it incentivizes behavior.

Through the utilization of technology, this app provides users with data-driven insights that can guide them in making decisions. The harmonious combination of stewardship and technological innovation exemplifies how information technology can offer solutions for complex challenges. The "Zero C" app serves as an example of how technology and environmental consciousness can collaborate leading to positive transformations.

By envisioning a world where everyone takes responsibility for nature, the "Zero C" app presents us with a pathway towards reducing carbon emissions and utilizing resources wisely.

It's not solely just focused on technology—it's about improving the world for everyone, which is truly remarkable.

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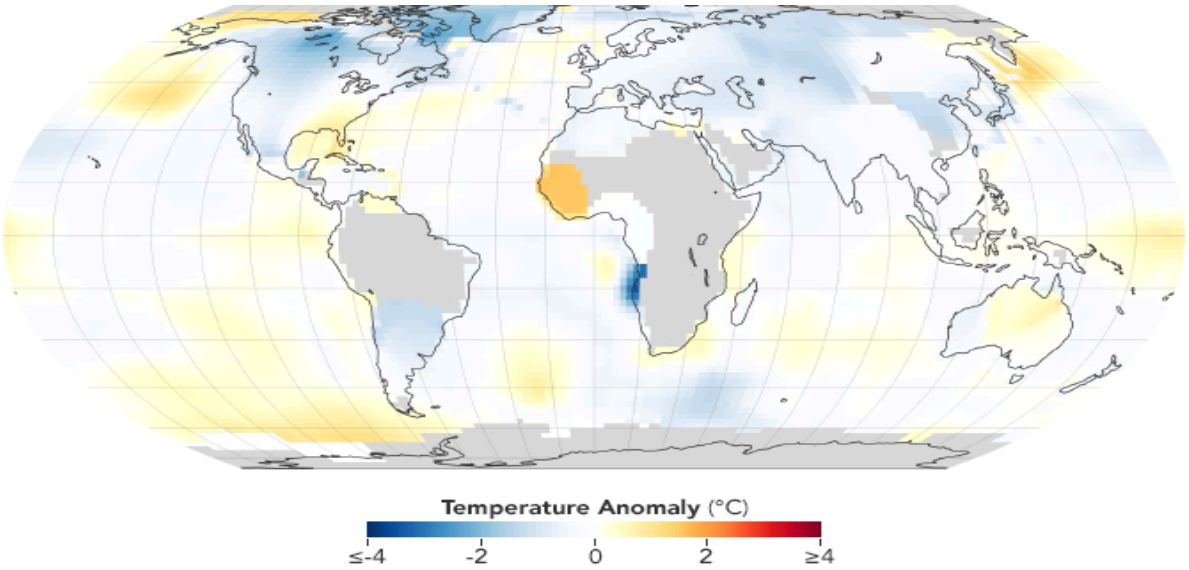
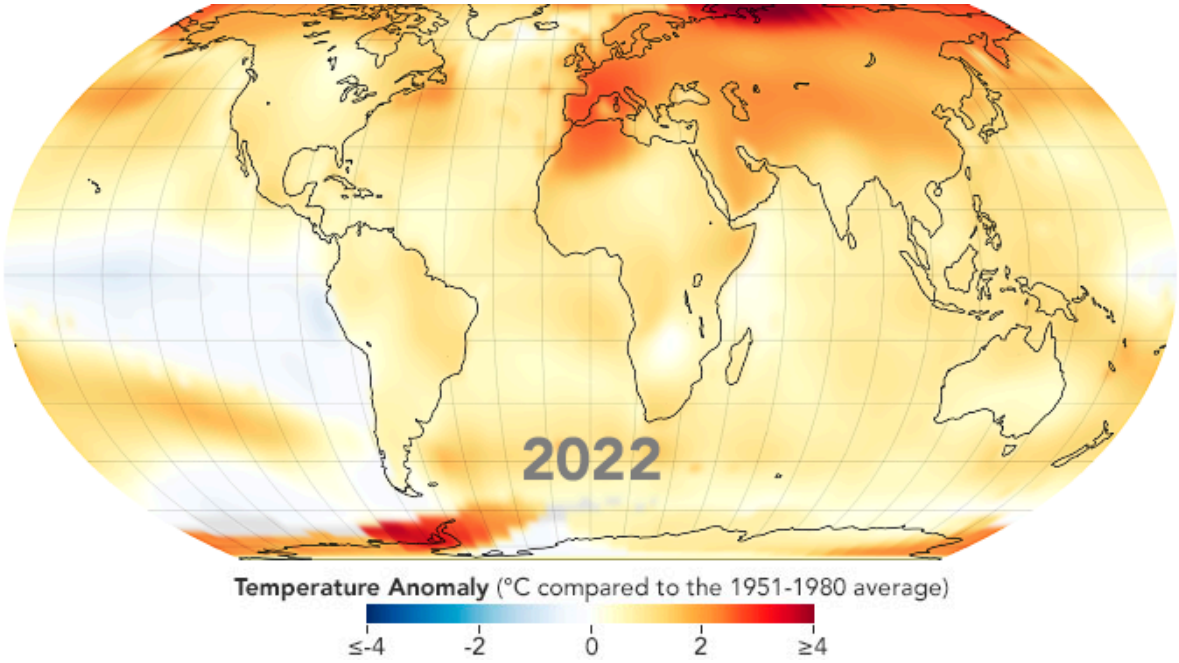
Appendices

Appendix A



The maps above show temperature anomalies in five-year increments since 1880. (Click on the arrow to run the animation.) These are not absolute temperatures, but changes from the norm for each area. The data reflect how much warmer or cooler each region was compared to a base period of 1951-1980. (The global mean surface air temperature for that period was 14°C (57°F), with an uncertainty of several tenths of a degree.)

The image below shows global temperature anomalies in 2022, which tied for the fifth warmest year on record. The past nine years have been the warmest years since modern record keeping began in 1880. As the maps show, global warming does not mean temperatures rise everywhere at every time by same rate. Temperatures might rise 5 degrees in one region and drop 2 degrees in another. For instance, exceptionally cold winters in one place might be balanced by extremely warm winters in another part of the world. Generally, warming is greater over land than over the oceans because water is slower to absorb and release heat (thermal inertia). Warming may also differ substantially within specific land masses and ocean basins.



Carbon Tracker App Interface: