UNIVERSITÀ TELEMATICA
INTERNAZIONALE UNINETTUNO

REPORTING CLIMATE CHANGE

Microcredentials for International Journalists

Academic Year 2024/2025

Final Pubblication
Essays and Reports
on Climate Change

In partnership with

COPEAM
Conférence Permanente de l'Audiovisuel Méditerranéen
المؤتمر الدائم للسمعي البصري في حوض البحر الأبيض المتوسط
Permanent Conference of Mediterranean Audiovisual Operators

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Contents

Published by **International Telematic University UNINETTUNO**,
Rome - Italy, January 2025

Forword

This publication is the result of the dedication of a community of people, including students, professors, professionals, industry experts, institutional representatives, and the staff and management of UNINETTUNO University and COPEAM. These key players believed in and contributed to this initiative - a journey that began in 2021 when COPEAM and UNINETTUNO, supported by the European Investment Bank (EIB), decided to combine their expertise to develop an e-learning program on climate change.

This program was designed specifically for journalists and media professionals from the Mediterranean region, individuals who bear the essential responsibility of delivering accurate, high-quality information in an era where fake news and misinformation play a significant and threatening role.

From 2021 to 2024, this program, offered free of charge to participants, successfully trained around 70 journalists. These professionals now serve in various capacities: within their countries' public broadcasters, as freelancers, or as journalists for private and local media organizations. In 2024, with the invaluable support of the Italian Ministry of University and Research, the program evolved into a full-fledged academic pathway.

It now certifies skills and knowledge through an officially recognized qualification, aligning with the European Commission's directive for universities in member states to innovate in both course design and delivery while enhancing the certification of learning outcomes.

This volume brings together 24 essays produced by students enrolled in the 2024 edition of the Reporting Climate Change – Microcredentials for International Journalists program. The students come from 20 different countries, predominantly from Africa. This year alone, the program delivered over 90 hours of distance learning through the UNINETTUNO University platform, leveraging its innovative model, and developed a digital library with more than 700 constantly updated resources available to students. The program also featured video lectures in four languages: Italian, English, Arabic, and French.

The essays published here serve as a powerful testament to the fact that climate change is a phenomenon affecting the entire planet, yet its most urgent challenges are often deeply rooted in local realities. These works highlight how local communities, particularly in emerging economies, are at the frontline of the climate crisis, emphasizing the need for targeted education, awareness, and solutions.

This volume is not only a demonstration of the program's impact but also a celebration of the collective effort to equip media professionals with the tools they need to inform, engage, and inspire action in the face of one of the most pressing issues of our time.

Nicola Paravati
Head of International Affairs at UNINETTUNO University

Introduction

Educating on Climate Change, innovation andnew challenges for a Global University

Maria Amata Garito, Emeritus Professor of Psycotechnologies, President and Rector of UNINETTUNO University

This work collects all essays written by journalists who attended the training course: Reporting Climate Change - Microcredentials for International Journalists delivered by the International Telematic University UNINETTUNO.
This training path was aimed at giving journalists from the Mediterranean and Africa area appropriate skills not only to raise their awareness of issues related to environmental problems but also to provide them with a set of tools such as, for example, knowledge of systems for monitoring the environment and skills that allow access, retrieval and processing of data, skills related to models that combine visual storytelling and direct involvement of the audience meant to explore the complicated and, in some respects, controversial world of environmental sustainability. The training project was carried out in cooperation with COPEAM, an association that brings together public broadcasters in the Mediterranean, including radio, TV and online newsrooms. Online newsrooms are very much involved in the real-time dissemination of news, in-depth analysis, and reports capable of reaching a very large audience and conveying content directly to the personal media of all individuals living in areas far from large cities, promoting widespread and direct information.

Thanks to the support of the EIB (European Investment Bank) in the first editions the project had already achieved important results. Today with the contribution of the MUR – the Italian Ministry of University and Research we have managed to transform the study path into an international academic path. We have applied innovation in the design and delivery of content in line with the new European directives pressing member countries and their universities to develop new short and professionalizing programs capable of certifying skills and training not only young students but also adult professionals as well. Thereby, we believe that answers can be given to the challenges of an increasingly globalized and interconnected society that requires continuous updating of skills and new approaches to certifying acquired knowledge.

To achieve these goals, we have applied in the field the results of international research projects in which our University has participated together with partners from all over Europe with the aim of moving what researchers have developed to a pragmatic level and creating a virtuous example of cooperation capable of applying research results in reality.

Seeing students from 20 different countries, mostly from Africa and from territories that need to develop a competent and updated information network, guided by international lecturers who used the psycho-pedagogical model and technological tools developed and applied by UNINETTUNO. Technologies and methodologies that have always allowed UNINETTUNO University to spread knowledge and certify skills without any more space and time limits. This project has not only spread knowledge and created skills, but has really contributed to bring different cultures closer together.

Environmental sustainability is a topic of great interest for the UNINETTUNO University; in the last few years it has been coordinating an important Horizon project, funded by the European Community, GREEN SCENT involving universities and companies from 10 European countries and aiming at training to make the young generations of Northern and Southern Europe aware of issues related to environmental sustainability.

The UNINETTUNO University has created a new research, development and training area, "UNINETTUNO Green" that aims to spread the culture of environmental sustainability by training young people, citizens and professionals. Thanks to this new area the University has set out to address some of the most pressing environmental challenges of our time, aligning with the goals of the European Green Deal and, in particular, the achievement of Climate Neutrality by 2050, with a focus on education and direct involvement of communities and to encourage them to speed up the processes leading to a climate change compatible lifestyle.

UNINETTUNO Green, as well as the Reporting Climate Change - Microcredentials for International Journalists project, involves a broad spectrum of disciplines, from psychology to communication, economics, and environmental sciences, with advanced technological tools.

Following the activities of the students during the study course, the quality of the papers submitted but also the commitment and enthusiasm shown during the teaching activities, we decided to collect the final thesis papers in this publication. This unplanned effort at the beginning of the study course proved, in its powerful simplicity, to be an incredible contribution to raising awareness of what is happening particularly in countries with emerging economies, such as the African ones. Reading our students' articles makes us realize how the issue of environmental sustainability and climate change is not a global issue, but it is directly related to local needs and contexts; only by having this in mind will it be possible to act, educate and fight for a better world.

Reporting Climate Change - Microcredentials for International Journalists fits well into the framework of the scientific and educational activities that our University carries out ensuring a coherent overview and strategic direction for all of its students, living in 165 countries around the world and not only for MENA journalists who are the target audience of this course.

Media and climate change, the need for new skills for quality information

Claudio Cappon, COPEAM Secretary General

This publication symbolically represents the last step, in chronological order, of a long and rich common path in favor of environmental sustainability and climate change.

For many years now, we have been engaged in a work of raising awareness of the media so that they deal more and better with these issues, placing them at the center of public debate and allowing every citizen to have access to all the information useful for understanding the climate transformation we are going through and to act in an informed manner.

To achieve these objectives, it is necessary that those who produce and convey that information are prepared and competent. From this perspective, the training of journalists is essential and it is starting from this belief that, since 2020, COPEAM and UNINETTUNO have been collaborating to offer journalists from the Mediterranean area, the Balkans, the Middle East and of all Africa, training and study opportunities in this specific field.

Climate change is, indeed, a very complex topic, sometimes divisive, with a strong technical component and all-round implications, from agriculture to public health, from energy policies to migration, from employment to biodiversity, from tourism to geopolitics. To remove climate and the environment from excessive simplifications, from the mere emergency framing, from the “clash between factions” and from misinformation, it is necessary to create a journalistic narrative that is first and foremost serious, in-depth and not episodic, ethically rigorous and based on transversal and multidimensional knowledge.

And it is precisely with these objectives in mind that COPEAM and UNINETTUNO have built the program of the “Reporting climate change” course, identifying teachers, experts and professionals from different countries and with complementary skills, to offer the beneficiaries of the course plural inputs and approaches.

Reading the papers written by journalists during this edition of the course, which you can find collected here, so varied in the themes and contexts of reference, accurate in the arguments, based on rich bibliographies and scientific sources, is the most tangible result of the great work that has been done.

Talking about climate and sustainability requires today more than ever a collective effort, by virtue of which the world of information and science, research and universities, institutions and international organizations must open up to each other, understand each other, talk to each other, exchange skills. As COPEAM and UNINETTUNO have been doing since years. Only this way we can influence people’s feelings and activate an indispensable cultural change. We hope that the international community of specialized journalists that we are building and training will carry forward this spirit of collaboration and exchange, perhaps developing transnational reports, sharing information, knowledge and contacts, thus making the current global climate challenge an opportunity for networking.

Essays and reports on Climate Change by the students

*Academic year **2024/2025***

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The Impacts of Recreational Fishing on Marine Ecosystems in Ghana

Abstract:

Recreational fishing, once a niche activity, has grown significantly in Ghana, attracting both local and international participants. While it provides important socio-economic benefits, it also poses risks to marine ecosystems.

This paper explores the complex relationship between recreational fishing and marine ecosystems in Ghana, with an emphasis on overfishing, habitat degradation, and the challenges of sustainable management.

By reviewing key theories in environmental science, examining local case studies, and offering policy recommendations, this study aims to provide a comprehensive framework for managing the impacts of recreational fishing while ensuring its long-term viability.

Keywords:

Recreational fishing, marine ecosystems, Ghana, biodiversity, overfishing, coastal management, sustainability, fish stocks, habitat degradation, conservation.

1. Introduction

Recreational fishing is increasingly recognized not only for its cultural significance and economic benefits but also for its potential environmental risks. In Ghana, a country with a rich marine biodiversity, the activity is growing in popularity due to tourism and local demand for leisure fishing. However, recreational fishing has the potential to alter marine ecosystems if not carefully managed. This paper will examine the impacts of recreational fishing on marine ecosystems in Ghana, integrating key theories on sustainable resource management and marine conservation.

The increase in recreational fishing can lead to resource depletion and environmental degradation, particularly when it operates without adequate regulation. This study employs several theoretical frameworks to understand the dynamics of fishing, such as the **Tragedy of the Commons and the Resilience Theory**, which explain how overuse of shared resources leads to ecosystem collapse and how systems can recover if managed sustainably. By examining the environmental and socio-economic implications, this paper proposes strategies for mitigating the negative effects of recreational fishing in Ghana.

2. The Role of Recreational Fishing in Ghana's Coastal Economy

Recreational fishing in Ghana plays a growing role in the local and national economy. The rise of fishing tourism, especially along the coast of the Western, Central, and Greater Accra regions, has contributed significantly to the economic development of coastal communities.

2.1 Economic Contributions of Recreational Fishing

Recreational fishing is part of the broader tourism industry in Ghana. While commercial fisheries dominate the sector in terms of fish catch and export, recreational fishing contributes to local economies through services such as guided tours, boat rentals, fishing gear sales, and accommodations. This growth has led to the establishment of new businesses and the creation of employment opportunities in local communities.

The increasing interest in fishing tourism has also stimulated the local economy by attracting international tourists. According to the Tourism Development Index of Ghana (2020), coastal tourism, which includes recreational fishing, has become one of the fastest-growing segments in the tourism sector. International anglers seeking big game fish, such as barracuda and tuna, are drawn to Ghana's relatively untapped fishing grounds.

2.2 Local Livelihoods and Social Benefits

In addition to economic revenue, recreational fishing provides social benefits for coastal communities. Fishing guides, boat captains, and local artisans who cater to tourists are directly impacted by the industry's growth. The activity also provides an avenue for local youths to engage with marine activities, offering training and apprenticeship opportunities in marine-related trades.

Theoretical Framework: The Tragedy of the Commons

The Tragedy of the Commons (Hardin, 1968) is a critical theory that explains how individuals, acting in their own self-interest, often overuse and degrade common resources such as fisheries. In Ghana, unregulated or poorly regulated recreational fishing could lead to the depletion of fish stocks, which would affect both local and international anglers. The theory highlights the need

for collective management and regulation to ensure sustainability. Without effective governance, overfishing could undermine the benefits derived from both recreational and commercial fishing sectors.

3. Environmental Impacts of Recreational Fishing

While recreational fishing contributes positively to local economies, it can have significant ecological consequences. These include overfishing, habitat destruction, and pollution.

3.1 Overfishing and the Decline of Fish Stocks

Overfishing is one of the most pressing environmental impacts of recreational fishing. Species targeted by recreational anglers, such as barracuda, snapper, and grouper, are highly vulnerable to overexploitation due to their slow growth rates and long reproductive cycles. Overfishing can result in reduced fish populations, which may affect not only the fishing industry but also the broader marine ecosystem.

Case Study: The Decline of Tuna Populations in Ghana

In recent years, the local tuna population in Ghana has declined due to a combination of commercial and recreational overfishing. Tuna, a prized species for both commercial and recreational fishermen, have been overharvested, leading to a noticeable reduction in catches. A study by the Ghana Fisheries Commission (2021) reported that recreational fishing activities have contributed to this decline, particularly in offshore waters where large game fish are targeted.

This overfishing situation in Ghana exemplifies the Tragedy of the Commons, where unrestricted access to marine resources by various sectors leads to unsustainable harvesting, which in turn results in the depletion of those resources for future use.

3.2 Habitat Degradation

Habitat degradation is another major consequence of recreational fishing. Marine ecosystems such as coral reefs, seagrass beds, and mangrove forests provide essential services to marine biodiversity by offering shelter, breeding grounds, and feeding habitats for fish. Recreational fishing, especially when boats anchor on reefs or fishermen trample seagrass beds, can cause irreversible damage to these habitats.

Case Study: Coral Reef Damage in Western Ghana

A report by the International Union for Conservation of Nature (IUCN, 2019) highlighted the damage to coral reefs in the Western Region of Ghana, exacerbated by both commercial and recreational fishing practices. Anchoring of fishing boats on fragile coral reefs has been a significant contributor to reef destruction. As coral reefs are vital for supporting marine biodiversity, their degradation has long-term consequences for the health of marine ecosystems and the fish populations they support.

Theory: Resilience Theory

The Resilience Theory (Holling, 1973) suggests that ecosystems can withstand certain disturbances and recover if managed properly. In the context of recreational fishing, resilience can be improved through the establishment of marine protected areas (MPAs), the regulation of fishing practices, and

habitat restoration projects. The theory emphasizes the importance of adaptive management and monitoring to maintain ecological balance and prevent ecosystem collapse due to overfishing and habitat destruction.

3.3 Pollution and Waste

Pollution from recreational fishing is another critical concern. Discarded fishing lines, hooks, and plastic waste often end up in the marine environment, posing threats to marine life. Wildlife such as sea turtles, dolphins, and seabirds are at risk of entanglement or ingestion of harmful materials.

Case Study: Plastic Pollution in Accra's Coastal Waters

In Accra, Ghana's capital, the beaches and coastal waters are frequently littered with plastics, much of it originating from recreational fishing activities. A report by the Ghana Environmental Protection Agency (2020) found that plastic waste, including fishing gear and bait containers, contributed significantly to pollution levels in coastal waters. This pollution harms marine life and impacts the aesthetics of coastal areas, reducing the attractiveness of the region for tourists.

4. Regulatory Measures and Sustainable Practices for Recreational Fishing

To address the environmental impacts of recreational fishing, Ghana must implement a range of regulatory measures and promote sustainable practices. Several management approaches have been proposed, including stricter fishing licenses, the establishment of marine protected areas (MPAs), and the promotion of eco-friendly fishing practices.

4.1 Regulations and Licensing

Introducing a licensing system for recreational fishermen, along with restrictions on catch limits, is one way to manage the impacts of recreational fishing. These measures can limit the number of anglers in a given area and ensure that fish stocks are not depleted beyond their capacity to recover.

Case Study: License Regulations in Seychelles

Seychelles, a small island nation in the Indian Ocean, has implemented a licensing system for recreational anglers. This regulation has helped reduce overfishing by ensuring that only registered fishermen are allowed to operate in certain areas. In 2018, Seychelles introduced a catch-and-release policy for several species, including game fish like marlin and tuna, which helped restore fish populations. This case study could serve as a model for Ghana.

4.2 Promoting Responsible Fishing Practices

Local communities and recreational anglers need to be educated on the importance of sustainable fishing practices. Initiatives such as catch-and-release programs, responsible gear usage, and the use of eco-friendly fishing tackle can reduce the ecological footprint of recreational fishing.

Case Study: Responsible Fishing Campaign in Kenya

In Kenya, the government, alongside local NGOs, has launched campaigns to promote sustainable fishing practices among recreational anglers. These initiatives focus on educating tourists and locals about the benefits of catch-and-release, the use of biodegradable lines, and avoiding overfishing. This model could be adapted in Ghana to encourage responsible fishing practices in the coastal regions.

4.3 Marine Protected Areas (MPAs) and Habitat Restoration

Establishing and enforcing Marine Protected Areas (MPAs) is an effective strategy for conserving marine biodiversity. These areas restrict or prohibit fishing to allow ecosystems to recover and fish populations to regenerate. Ghana has a few MPAs, but enforcement is inconsistent. Expanding and strengthening these MPAs can protect vulnerable marine habitats from the pressures of recreational and commercial fishing.

5. Conclusion

Recreational fishing in Ghana presents both opportunities and challenges. While it offers significant economic and social benefits, it also has the potential to degrade marine ecosystems if not properly regulated. The Tragedy of the Commons and Resilience Theory provide useful frameworks for understanding the dynamics of recreational fishing and its impacts on marine biodiversity. By implementing more effective management strategies, such as licensing, the establishment of MPAs, and public education campaigns, Ghana can strike a balance between supporting the recreational fishing industry and conserving its marine resources for future generations.

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Navigating the Complex Landscape of Climate Change Journalism

Abstract:

This essay provides a comprehensive overview of key themes explored in the course “Reporting Climate Change.” It delves into the challenges and opportunities of climate change journalism, examining the socio-political, economic, and environmental implications. The essay explores the diverse perspectives on climate change, from denialism to activism, and analyzes the role of data visualization in communicating climate science.

Additionally, it investigates the impact of climate change on specific regions, such as the Mediterranean and Zimbabwe, and examines international efforts to mitigate and adapt to climate change, including the European Green Deal and global climate diplomacy.

Keywords:

Climate Change Journalism, Reporting Climate Change, Denialism, data visualization, Green Deal.

Introduction

The course “Reporting Climate Change” offered a multifaceted exploration of the complex and urgent issue of climate change. It delves into the challenges and opportunities of climate change journalism, examining the socio-political, economic, and environmental implications. This essay provides a comprehensive overview of the key themes explored in the course, highlighting the importance of accurate and effective climate change reporting.

The decision to report on climate change is a significant one, fraught with challenges and opportunities. Climate change is a complex and often-contentious issue, requiring journalists to navigate a minefield of misinformation and disinformation. However, it also presents a unique opportunity to inform the public about one of the most pressing issues of our time. As highlighted in Boykoff (2011), climate change journalists must be equipped with the knowledge and skills to accurately report on this complex topic. Boykoff (2011) further emphasizes that climate change journalists need a strong foundation in climate science to effectively communicate this complex topic to the public. This includes understanding the underlying causes, potential impacts, and the latest scientific consensus on climate change. Additionally, journalists must possess strong critical thinking and research skills to accurately evaluate information and identify potential biases in reporting. By being well-equipped with knowledge and skills, journalists can provide accurate, balanced, and informative coverage of climate change, empowering the public to make informed decisions and take action.

The course delve into issues of Climate Change in the Mediterranean. The Mediterranean region is particularly vulnerable to the impacts of climate change, facing challenges such as water scarcity, heatwaves, and sea-level rise. The region also presents significant opportunities for sustainable development, particularly in the blue economy. However, realizing these opportunities requires careful planning and policy implementation. Gaaloul, Eslamian, and Katlance (2021) highlight the severity of these challenges, particularly in the southern Mediterranean countries. They emphasize the need for immediate and integrated responses to mitigate the impacts of climate change and ensure sustainable water resource management in the region.

Climate change poses a significant threat to global food security, impacting agricultural production, food distribution, and consumption patterns. As explored in Gregory, Ingram & Brklacich (2005), rising temperatures, extreme weather events, and shifting precipitation patterns can disrupt food systems, leading to food shortages, price volatility, and malnutrition. They further argued that, there are multiple socio-economic and bio-physical factors affecting food systems and hence food security, however, the capacity to adapt food systems to reduce their vulnerability to climate change is not uniform. Improved systems of food production, food distribution and economic access may all contribute to food systems adapted to cope with climate change, but in adopting such changes it will be important to ensure that they contribute to sustainability. Agriculture is a major contributor of the greenhouse gases methane (CH4) and nitrous oxide (N2O), so that regionally derived policies promoting adapted food systems need to mitigate further climate change.

In this programme, I was introduced to the The Warsaw International Mechanism on Loss and Damage which is a crucial component of international climate policy, addressing the impacts of climate change on vulnerable communities. As discussed in Byrnes & Surminski (2019) this mechanism seeks to provide financial and technical support to countries suffering from climate-re-

lated loss and damage. However, its implementation has been fraught with challenges, including disagreements over funding and liability. The Warsaw International Mechanism for Loss and Damage (WIM) is a United Nations Framework Convention on Climate Change (UNFCCC) body established in 2013 to address the issue of loss and damage associated with the adverse effects of climate change. Byrnes & Surminski (2019) argues that the WIM aims to provide financial and technical support to vulnerable countries that are disproportionately affected by climate-related disasters and slow-onset events. This support can be used in assisting countries in rebuilding

infrastructure, restoring livelihoods, and providing emergency relief. The funds can help countries develop strategies to adapt to future climate impacts and reduce their vulnerability. Besides, the funds supports countries in coping with gradual processes like sea-level rise, desertification, and ocean acidification. The WIM has been a significant step forward in acknowledging the need to address loss and damage, but it has faced challenges in securing adequate funding and operationalizing its functions. However, it remains a crucial platform for discussions and negotiations on this critical issue. The politics of climate change are complex and often divisive. As explored in Keohane, (2015) understanding the diverse perspectives on climate change, from denialism to activism, is essential for effective climate communication. By mapping the political landscape of climate change, journalists can identify key stakeholders and potential areas of consensus. Dunlap & McCright (2011) talk about “Organized Climate Change Denial,” they delves into the organized efforts of individuals, groups, and industries to cast doubt on the scientific consensus regarding climate change. This denial campaign has been instrumental in delaying climate action and hindering public support for climate policies. They question the scientific consensus by highlighting uncertainties and promoting dissenting opinions, often from non-experts., they also provide financial support to scientists who produce research that challenges the mainstream climate science. To some extent, they influence government policies to weaken climate regulations and promote fossil fuel interests. The media and public relations tactics to shape public opinion and discredit climate scientists by controlling the media narrative through op-eds, letters to the editor, and media appearances. By understanding the tactics and motivations behind organized climate change denial, we can better counter these efforts and promote evidence-based climate action.

On the other end Roser-Renouf et al. (2014) explored the psychological factors that motivate individuals to engage in climate change activism. Their research suggests that a combination of beliefs, perceptions, and social influences contribute to the decision to take action. They argue that individuals who strongly believe in the reality and severity of climate change are more likely to become activists. Also, the belief that individual actions can make a difference, as well as the perception of collective efficacy, is a strong motivator for activism. Besides, social networks, such as friends, family, and community leaders, can significantly influence individuals’ decisions to become activists. And, Individuals who are seen as knowledgeable and influential within their social networks are more likely to mobilize others to take action. They highlight the importance of addressing both cognitive and affective factors in promoting climate activism. By emphasizing the urgency of the climate crisis, highlighting the potential for individual and collective impact, and fostering supportive social networks, it is possible to inspire more people to become active participants in the fight against climate change.

We learnt that Public perception of climate change plays a crucial role in shaping policy and individual behavior. As discussed in Weber (2010) under-

standing the factors that influence climate change perception can help inform effective communication strategies. Additionally, it is important to recognize that climate change impacts are not evenly distributed, with marginalized and vulnerable communities often bearing the brunt of the consequences. According to Weber (2010) these factors include personal experiences with extreme weather events, the influence of social networks and cultural values, and the role of media coverage. Additionally, psychological factors such as risk perception, trust in scientific institutions, and political ideology play a significant role in shaping beliefs about climate change. Understanding these factors is crucial for effective communication and engagement on climate change issues, as it helps identify the most effective messaging strategies and target audiences.

The programme focused on Environmental Crime and Climate Change. Environmental crime, such as illegal logging, wildlife trafficking, and pollution, is a growing threat to the environment and exacerbates the impacts of climate change. As explored in White (2020), combating environmental crime requires international cooperation and effective law enforcement. White's offers a comprehensive exploration of environmental harm in its various forms. He delves into the complex interplay between human activities and the natural environment, examining the legal and ethical dimensions of environmental degradation. He further provides a critical analysis of the social, economic, and political factors that contribute to environmental crime, highlighting the need for interdisciplinary approaches to address these challenges. The programme helped us to understand crimes, which include pollution, illegal wildlife trade, deforestation, and climate change, offering valuable insights for climate change journalist.

As climate change Journalists, we were introduced to the European Green Deal and Climate Policy. The European Green Deal is a comprehensive strategy to make Europe climate-neutral by 2050. As discussed in Bäckstrand (2022), this ambitious initiative includes a range of policies and measures to reduce greenhouse gas emissions, promote renewable energy, and improve energy efficiency. Bäckstrand (2022) explores the European Union's ambitious goal of achieving climate neutrality by 2050. The European Green Deal and the Climate Law are key policy frameworks designed to drive this transition. He further explains that the Green Deal outlines a comprehensive strategy for greening the EU economy, while the Climate Law sets binding targets and establishes a governance mechanism to ensure progress. Bäckstrand analyzes the potential impacts of these policies on various sectors, such as energy, transportation, and industry.

The course took us through the International climate diplomacy described as a complex and often-contentious process, involving a wide range of actors with diverse interests. It entails negotiations and collaborations among countries, international organizations, and non-state actors to address global climate change. Key challenges include balancing national interests with global goals, bridging the gap between developed and developing countries, and securing adequate financial resources for mitigation and adaptation efforts. Moreover, the evolving geopolitical landscape, economic disparities, and differing levels of vulnerability to climate impacts further complicate the diplomatic process.

The programme emphasize on data visualization by journalists reporting on climate change. Visualisation has been described a powerful tool for communicating complex climate information to a wide audience. By transforming raw data into visually appealing and easily understandable formats, such as

charts, graphs, and maps, data visualization can effectively convey key insights, trends, and patterns. This can help to raise awareness about climate change, foster public engagement, and inform decision-making. Additionally, data visualization can be used to highlight the impacts of climate change on different regions and sectors, enabling targeted interventions and policy responses.

Conclusion

The “Reporting Climate Change” course provided a comprehensive overview of the complex and urgent issue of climate change. It equipped us with the knowledge and skills necessary to report on this critical topic accurately and effectively. By exploring the scientific, social, economic, and political dimensions of climate change, the course highlighted the importance of evidence-based journalism and critical thinking. From understanding the impacts of climate change on vulnerable communities to analyzing the complexities of international climate diplomacy, the course provided a solid foundation for reporting on climate change. By leveraging data visualization techniques and engaging with diverse perspectives, climate change journalists can play a crucial role in informing the public and driving climate action. Ultimately, the goal is to promote informed decision-making, foster public engagement, and contribute to a sustainable future.

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How much climate change is dragging down the economy in Zambia? Predictions, solutions and outcomes.

Abstract:

This article examines the profound economic consequences of climate change in Zambia, assessing both current impacts and future projections, with a focus on media representation and the effectiveness of climate change reporting in shaping public understanding and response. The analysis centers on two prominent media outlets Zambia News and Information Services (ZANIS) in Lusaka and Radio Chikuni in the Southern Province to evaluate their climate change coverage, including the content, frequency, and thematic focus of their reporting. The study adopts a mixed-method approach, utilizing both quantitative and qualitative research techniques to provide a comprehensive evaluation of the economic sectors most affected by climate change, including agriculture, energy, and water resources, all of which are critical to Zambia's economy and are especially vulnerable to climate-driven disruptions.

The paper explores the critical role that media can play in driving public awareness and societal response to climate change. By examining challenges faced by journalists, such as limited resources, lack of specialized training, and insufficient access to expert information, the study uncovers barriers that hinder effective climate change reporting. Additionally, it considers how climate stories resonate with audiences, potentially shaping perceptions and understanding of climate risks, which in turn may influence policy advocacy and public engagement with climate resilience measures.

Building on these insights, the study offers targeted recommendations to strengthen climate change reporting in Zambia. First, it advocates for the

Keywords:

Economic impact, Climate change, Journalism education, media coverage, Zambia

expansion of information sources and the development of partnerships between media outlets and climate-focused institutions, which can enhance access to accurate, timely data and expertise. Second, the article calls for a multidimensional approach to climate reporting, encouraging coverage that integrates social, economic, and political dimensions to capture the full spectrum of climate impacts on Zambian communities. Third, it emphasizes the importance of investing in journalist training programs focused on climate issues to build capacity and foster motivation among media professionals.

Finally, the study highlights the necessity of embedding climate change topics within journalism education curricula, equipping future journalists with the skills and knowledge required for impactful reporting on environmental challenges.

Through these recommendations, the article underscores the pivotal role that Zambian media could play in elevating climate discourse, promoting informed public dialogue, and galvanizing collective action toward climate resilience. By enhancing climate change reporting, media outlets have the potential to drive societal engagement and inspire proactive measures to mitigate and adapt to climate impacts, ultimately contributing to a more sustainable and resilient Zambia.

Introduction

How much climate change is dragging down the economy in Zambia?

Predictions, solutions and outcomes:
In recent years, the Southern part of Africa has faced hash effects of climate change in various forms. This has led to changes in temperatures and other extreme events such as droughts and floods that have increased. These changes have had significant negative impacts in the region, although the impact varies from one country to another. Countries like Zambia have had their economies affected the most due to lack of adaptive capacity.

Thus, this article aims to explore how much climate change continues to drag down the economy in Zambia. Also detailing predictions, solutions and outcomes. The results from the research carried out in some selected media houses and way forward will be discussed but it will start with the introduction and summing it up with a conclusion.

According to an assessment led by the Stern Review Commission in 2007, it recommends that all countries should incorporate climate change measures in their development policies, plans and strategies. There has been however, limited research and literature to analyses how much improvements governments have done to embed in their polices climate change adaptation plans as they implement different plans as well as looking at the way the climate change has dragged down the economies.

Since the country's independence in October 1964, Zambia's economic structure and linkages of its economy has largely been depended on copper mining. This remains the case 60 years on, despite attempts by successive governments to re-focus policy towards industrializing and diversifying the economy. Copper dominates exports, accounting for around 70% of foreign exchange earnings. The mining sector is also an important contributor to employment, providing over 82,725 by 2014.

This dependence on the mining industry implies that Zambia's economy is highly vulnerable and sensitive to world commodity price fluctuations and

change in climatic conditions such as drought, due to the dominance of hydropower in Zambia's electricity supply. To elaborate this, in 2015, the copper output target was set at 800,000 metric tons but the realized output was 711,000 metric tons.

This was largely attributed to low copper prices and power shortages which has further been felt nine years later in 2024 due to the prolonged dry spell that affected the 2023/2024 rainy season (GRZ, 2017, MMMD, 2018).

1. How Climate Change has dragged down the agriculture sector:

On the other hand, agriculture is another critical sector in Zambia's economy. Although its contribution to Gross Domestic Product (GDP) has reduced over the past two decades ,it remains the largest employer, with over 60% of the population employed in the sector. This sector is one of the government's earmarked sectors for economic diversification with only 15% of 47% of Zambia's arable and fertile land surface under cultivation.

There has been a decrease in the sector's productivity and contribution to GDP which has largely been attributed to worsening and erratic climatic conditions. This decrease has translated into worsened state of household welfare and livelihoods, particularly for rural households which has further pushed up the poverty levels to 60% from 54% in recent studies (MTENR, 2011; MNDP, 2016; GRZ, 2017, World Bank, 2020).

The most recent estimates showed that the Zambian economy grew in the year 2018 by 3.7% compared to 3.5% in 2017, this slight increase in growth reflects strong performance of services such as in particular wholesale and retails, pensions, and information and communication sectors. However, the El Nino-induced droughts which have affected 87 of the country's 116 districts has compelled the government to slash the economic growth forecast to 2.3% from 4.8% in 2024.

The electricity power cuts which extend beyond 22hrs have further choked growth and pushed inflation to about 15.6% by October 2024 in Africa's second-biggest copper producer that is still emerging from a painful, prolonged debt restructuring (World Bank, 2019).

Zambia's economic performance seems to connect with climate variability based on the current growth trajectory which has dwindled as can be seen by the occurrence of major economic downturns such as reduction by more than half in the economic growth forecast by the year 2024. This is partly attributed to Zambia's high degree of dependency on agriculture and natural resources, both of which are climate-sensitive sectors.

Extreme weather events such as droughts are already happening and have increased in intensity and frequency especially in the year 2024. Climate-induced changes to physical and biological systems are already exerting considerable stress on the country's vulnerable sectors. Given the climate predictions and associated vulnerabilities, it is critical to understand the scope and breadth of the economic impacts of climate change as it relates to the Zambian economic environment.

Wade (2015) pointed out that the most profound implications of climate change may be its negative effect on economic growth in the long run. For example, global warming has primarily influenced economic growth through damage to property and infrastructure, lost productivity, mass migration and

security threats. Zambia's actual growth trajectory depend on both the adaption and mitigation options available.

2. Climate Change effects on Zambia's Energy sector:

Zambia's energy sector, particularly the electricity sector, is extremely vulnerable to climate change and variability, particularly given that 85% of the country's 2,827 Megawatt (MW) installed capacity is hydro with its major source being lake Kariba tacked in Siavonga district in Southern Province. Despite its vulnerability, the electricity sector has been identified as a key driving force for economic development; it is critical to the country's industrialization activities. The country's hydro-power production is susceptible to droughts, which implies that the whole economy is also vulnerable to climate variability shock. Furthermore, lack of access to clean energy leads to increased consumption of firewood and charcoal, which exacerbates deforestation, and this in turn reduces the river runoff needed for sustainable hydropower generations (Ebinger and Vergara, 2011; Hamududu and Killingtveit, 2012; WMO, 2015; CSO, 2016).

The petroleum sub-sector is another important aspect of the country's economy as it contributes a crucial 9% to the nation's total energy requirements. It plays an important role in powering Zambia's economy particularly in the agriculture, transport, and mining sectors.
Therefore, an increase in world oil prices would have ramifications on the operations of the transport and mining sectors. According to the Zambia Development Agency, the demand for petroleum products increased by about 100% over a period of six years (2007-2013) but has recently been affected by climatic changes.

More also, other studies suggest that climate change in the absence of mitigation policies would reduce Zambia's GDP by about 6% by 2045-50. These average results show that Zambia's real annual GDP growth rate would decline between 0.02 and 0.04 percentage points because of climate change. At the sectoral level, electricity and agriculture are the most affected. Unlike the roads channel, the impact of shocks that came through the energy channel are being minimized and contained by increasing electricity imports. Without these, the impacts of the energy channel would even be worse than the roads channel.

There is an urgent need to bring to the fore two policy issues which are; investing in climate resilient electricity-generating technologies and clear electricity trade policy. This can be achieved through embracing modern climate adaptation and mitigation measures, especially as the country implements the 2025 National Budget that has allocated some funds towards climate change fight.

3. COP29 a prospective engine to enhancing climate change financing to Zambia.

The desire to have considerable amounts of resources allocated toward mitigation and adaptation in developing countries like Zambia, resonates very well considering the forth coming 29th Conference of Parties in Baku which started yesterday (Nov 11th) and runs through to 22nd 2024, were discussions around climate financing and loss and damage payments have already started taking center stage to address a new diverse global climate finance goal and build resilience to climate finance chain.

Delegates from both blue and green zones and the over 500 accredited media houses are advocating for more funding towards climate change fight especially by countries in the global south such as Zambia and an emphasis is on carbon market.

Despite the scarce funds currently available for adaptation, some Parties to the UNFCCC have suggested prioritization between eligible countries based on their vulnerability to climate change and to develop a vulnerability index for doing so. Iam alive to the fact that Article 4.4 of the Convention commits developed countries to assist developing countries that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation to those adverse effects.

Though this may raise the question as to what it means to be particularly vulnerable and how it is decided which countries fall into this category, Zambia, however, stands in position to benefit from climate financing due to several factors.8 districts in Zambia have been affected by drought because of the effects of climate change and almost all sectors of the economy have not been spared.

For example, the agriculture sector, which is one of the key sectors of the economy, faces severe effects which have resulted in high cost of staple food (mealie meal) and feed stocks. This means both the fisheries and livestock subsectors have not been spared by the drought.

More also, resilience in climate change faces a challenge. The 2024/2025 farming season is here, unfortunately small-scale farmers who are major contributors to the country's food basket are grappling with food as they are currently surviving on government's timely interventions (cash for work, relief food and social cash transfer).

Though not recommended, farmers who cannot afford certified seeds normally depend on recycled seeds from the previous farming seasons, sadly, they were robbed of the opportunity to stock any seeds for the last farming season due to the prolonged drought. Where will they access the seed this season for the country to secure food security next year? Thus, all delegates at COP29 from either blue or green zones should continue to advocate for climate financing and loss and damage payments to Zambia to expedite resilience and this can be achieved through the carbon trading talks as observed during the opening session yesterday (November 11, 2024).
The research conducted by the author covering one year period (covering period June 2023 to June 2024) aimed to analyze the coverage of climate change by the broadcast media in Zambia as characterized by the Zambia News and Information Services Head Office(ZANIS HQ) and Chikuni radio station in Lusaka and Southern Provinces of Zambia.

The objectives of the study were met as shown below:
The first objective was to find out how many climate change editorials do ZANIS HQ and Chikuni radio station have. Accordingly, it was established that the coverage of climate change by ZANIS HQ and Chikuni radio station is limited.

From October 2023 to March 2024, only one news story relating to climate change was aired.

Furthermore, only six documentaries relating to climate change were aired, of which only four had climate change as a major concern or theme. With

current affairs, four programmes with climate change information were aired, of which only one current affairs programme focused on climate change while the remaining three did not entirely focus on climate change. As such, it can be concluded that the frequency in which ZANIS HQ and Chikuni radio station report on climate change issues is minimal.

The second objective was to determine the content of climate change published by the selected media houses.

The research established that there were limited climate change themes in the content covered under the news stories, documentaries and current affairs programmes.

Inclusion of climate Change content in some cases was only done as a subset of other issues reported on the channel. It was evident from the study that other themes not related to climate change in Zambia such as warmer oceans, rising sea levels and shrinking snow and ice cover were left out from local productions.

This could be because one of the main variables affecting story choice in the media is proximity, hence their exclusion.

With regards to the journalist's perspective, out the 15 journalist surveyed, 10 representing 67 per cent, agreed that low agriculture yields, loss of livestock, deforestation and low water levels were prioritized by ZANIS HQ and Chikuni radio station, while 11 representing 73 per cent noted prolonged hot and dry seasons while nine representing 60 per cent noted significant decrease in rainfall.

On the other hand, the audience survey showed that significant decrease in rainfall was more of a priority in the ZANIS HQ and Chikuni radio station content on climate change.

Lastly, the expert survey unveiled that climate change content and themes on ZANIS HQ and Chikuni radio station concentrated on government's response to climate change, as well adaptation measures, challenges in the adaptation programmes, and agriculture climate change related issues.

The third objective of the research was to identify the challenges that journalists faced at the ZANIS HQ and Chikuni radio station when covering climate change issues.

Accordingly, the study established that the coverage of climate change was characterized by several challenges, key among them: limited engagement of the available climate change sources, limitations in financial resources and climate change related materials.

4. Challenges faced by Journaists in Zambia to report climate change.

In terms of challenges journalists from ZANIS HQ and Chikuni radio station face in reporting climate change, three were predominant, first being the limited available sources to interview while limitations in financial resources and climate change related materials ranked second among the challenges. The least cited were lack of specialized training in climate change reporting, the technicality of the subject and lack of a climate change desk. See Figure below.

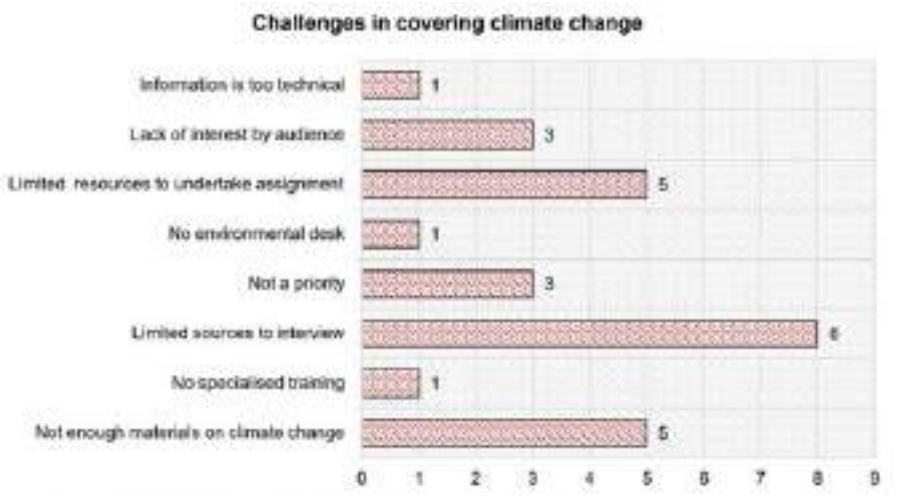

Figure 11. Distribution of challenges in coverina Climate Change

Additional challenges cited were a perceived lack of interest by the audience, climate change not being a priority for journalists, lack of specialized training in climate change reporting, the technicality of the subject and lack of a climate change desk.

Further, the study established that the coverage of climate change was largely motivated by journalistic instincts. This arguably results in a lack of consistency with regards to the content being aired because climate change coverage by journalists at ZANIS HQ and Chikuni radio station is rather instinctive than systematic.

More so, the study found that lack of variety with regards to information sources on climate change issues is a problem for the journalists at ZANIS HQ and Chikuni radio station. The study also found that climate change training was inadequate for the journalists, and hence attributed to their limited knowledge on climate change. Amongst the very few that reported to have attended such trainings, the majority were there to cover the event.

Lastly, the fourth objective was to find out the influence of climate change stories on the lives of the audience.

5. Conclusion and the state of human behaviors towards Climate Change

The study established that the climate change stories covered by the ZANIS HQ and Chikuni radio station, did not help societies to either adapt and/or mitigate climate change, on a large scale. It only helped the audience to a less extent. The research showed that many people were not sure of seeing any evidence of behavior change in the community.

Others clearly indicated not seeing such evidence while only a minimal number affirmed seeing evidence of behavior changes in the community due to information provided by ZANIS HQ and Chikuni radio station on climate change. Through the expert's interview, the research also established that climate change coverage has not had an influence on the general public because the issue is rather behavioral, and it would take a while for people's behaviors and perceptions to change.

6. Wayfoward on averting the hash effects of climate change in Zambia so that it doesn't drag down further the economy.

Based on the findings from the research, more is expected from media in general in Zambia as well as ZANIS HQ and Chikuni radio station they should provide information of national importance and climate change.
The research recommends the following:

1. ZANIS HQ and Chikuni radio station and the media in general should expand and diversify their information source base to cover the subject comprehensively.
2. ZANIS HQ and Chikuni radio station and the media in general should partner with climate change departments and organisation to cover more of other issues related to climatechange and to have resources and knowledge on the subject.
3. ZANIS HQ and Chikuni radio station and the media in general should cover climate change more from a social perspective and include the political aspect for solutions to makeit interesting and educative for the audience.
4. ZANIS HQ and Chikuni radio station and the media in general should set up deliberatelearning programmes or training workshops with the help of climate change organisations in order for them to better understand climate change and to be motivated and interested in prioritizing its coverage.
5. Colleges and universities should enhance the training on coverage of climate change, seeing it is a topical subject. This recommendation follows the findings that journalists at ZANIS HQ and Chikuni radio station to be able to consider their training in climate change reporting inadequate.

Conclusion and Action needed

Thus, more trainings for journalists on climate change mitigation, adaptation and resilience are needed if people in Africa and Zambia are to join the climate change fight. The training can look at forest restoration and the media, sustainable agriculture, climate mitigation and adaptation and well as training on how the media can be tracking commitments made and actions taken before, during and after the conference of parties (e.g. COP 28 and COP29 etc).

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Global warming and Climate change. One issue of two separate ones? Present your point of view and how to report it.

Abstract:

Global warming and climate change are often mentioned interchangeably. Of course, the two concepts have many elements in common. But the scientific facts in recent decades clearly show that global warming, associated with an increase in the average global temperature, is causing another global phenomenon - climate change. The changes that higher temperatures cause in the Earth's climate system find expression in a variety of extreme weather events: from prolonged drought and forest fires to storms, torrents, floods, hail and sudden cold snaps.These phenomena are observed more and more often and affect more and more areas of the world. People had taken Africa's drought for granted before desert areas swept across southern Spain, and desert storms began to carry sand from the Sahara all the way to populated areas in Western Europe. Hurricanes are no longer a trademark of the tropical climate zone. Tornadoes are observed more and more frequently off European coasts.

The increase in the number, scale and damage of extreme weather events coincides with the increase in the average temperature around the world. Weather forecast data is increasingly making headlines because of extreme weather events that are far more devastating than all the world's armed conflicts. Global warming, which is bringing unpredictable changes to climate patterns, requires increasingly well-prepared journalists. Their media mission is particularly responsible, because the way they handle the facts and inform the public largely depends on what attitudes on the subject will be formed among the public and what actions people will take in the fight against climate change.

Keywords:

Global warming, Climate Change, droughts, floods, hurricanes, extreme weather, environmental journalism

Introduction

Ever hottest - recently the Earth is experiencing the seasons of records. In this case, we are not talking about the well-known seasons, but about the “season” of higher temperatures, which covers a considerable period of time. The 2024 is on track to be the warmest year on record, according to the World Meteorological Organization (WMO) (10).

This year we have witnessed temperature records being set every month. From January to September 2024, the global average temperature turned out to be 1.54 (±0.13) °C higher than pre-industrial values. The only consolation is that, for now, this is accepted as an isolated case and not a regularity. The hope lies in the long-term measurement data, which show that the global temperature has not reached and permanently passed the critical limit of 1.5 °C set by the Paris Agreement. However, the climate trend is becoming increasingly alarming - the Earth is starting to look more and more like a hot pot.

“The era of global warming has ended and the era of global boiling has arrived”, said in July 2023 the UN secretary general Antonio Guterres. (5) “Humanity is in the hot seat For the entire planet, it is a disaster. And for scientists, it is unequivocal – humans are to blame. All this is entirely consistent with predictions and repeated warnings. The only surprise is the speed of the change. Climate change is here, it is terrifying, and it is just the beginning. ”, said Guterres.

According to the World Meteorological Organization report 2015-2024 will be the warmest ten years on record. A statistic that is accompanied by more worrying trends - Antarctic sea ice second lowest on record and glacier loss accelerates.

Seasons of record are becoming the new normal to which humans must adapt. A normality that has cast into history the clear outlines of the seasons in temperate latitude countries.

Just 15 years ago in Bulgaria the spring was coming beautifully, with the scent of flowers, rain and sun. Even in the big cities, the snow lingered for weeks. Summer started in July and ended at the end of August. Autumn also followed the typical characteristics of a temperate country. Climate changes that had remained invisible to sceptics in Bulgaria were suddenly felt strongly. In recent years the snow disappeared from the big cities, spring became blurred between the winter and summer months, and the summer became very long and unbearably hot. The example of the Bansko ski resort in the Pirin Mountains, near the border with Greece, is particularly typical. Until recently, this resort offered excellent conditions for winter sports. Even World Cup starts in alpine skiing were held there. But lately, winter temperatures have been consistently above freezing and rainfall has been decreasing. The lack of snow is compensated by special artificial snow cannons on the slopes. But even these cannot provide a lasting blanket in plummeting temperatures. As a result, several World Cup races have been postponed. But more worryingly, the ski season is getting shorter. Two decades ago, the ski slopes in Pirin were covered with natural snow for four to five months. In the last few years, the active season for winter sports has been within two to three months. Facts such as these forced even the biggest sceptics to admit that global warming has also reached our country.

Global warming is making Europe one of the regions most vulnerable to climate change. Periods of long heat waves and apocalyptic floods are beco-

ming more frequent. Natural disasters are claiming more and more human lives. According to the World Health Organisation, about 175 000 people die every year in Europe because of the heat. Heat-related deaths on the continent have risen by 30 per cent in the last 20 years. “Heat stress is the leading cause of climate-related death in the region. Temperature extremes exacerbate chronic conditions, including cardiovascular, respiratory and cerebro-vascular diseases, mental health, and diabetes-related conditions. Extreme heat is a problem particularly for elderly people, especially those living alone. It can also place an additional burden on pregnant women.”, wrote in a statement the WHO Regional Director for Europe, Dr Hans Henri P. Kluge. (9) In 2024 alone, floods in Europe claimed hundreds of victims. Warm waters off the Spanish city of Valencia and cold air currents formed DANA. A disaster that the Spanish Prime Minister called “the most powerful storm of the century!” (1)

1. How climate is reshaping the global map

The United States has lost about 400 glaciers since the middle of 20th century. In Switzerland more than 1000 small ones are lost. East Africa has less than 2 square kilometres of total glaciers remaining. (8) According to UN research Iceland`s glaciers are retreating so fast that the future generations will wonder how the ancient nation got its name. Scientists predict that by 2100 the climate will wipe out many of the familiar sights we know now. Half of Earth’s glaciers are expected to disappear by then. (6)

And while in Switzerland people cover mountain glaciers with insulating sheets to keep them from disappearing, in small island countries like Tuvalu they are preparing for the worst - the land where they live to be swallowed by the ocean and disappear from the world map. The fourth-smallest country on Earth at 26 square kilometres could disappear by 2050.

Sea level rise due to global warming is a well-known topic in the media. The question arises as to how to present this subject in such a way as to touch audiences in different parts of the world. In an interview that the Foreign Minister of Tuvalu, Simon Kofe, gave to me as a reporter for the Bulgarian National Television, he said: “In Tuvalu, we live in a climate change reality. As we do this interview, the ocean level is rising. We can no longer wait for the speeches to end and speak up, because the water is rising around us. The issue of climate migration must become a leading issue. We must take strong action today to save our tomorrow.” The interview with Simon Coffee was done immediately after COP 26 in Glasgow in 2021. (3)

“The highest point in our country is 4 metres above sea level. Climate change is something that we face all the time. We’re constantly threatened by rising ocean waters, erosion, but also, here on Tuvalu, we face drought. Every year about 100 people leave Tuvalu. They leave for various reasons. They move to Australia, New Zealand, the United Kingdom and the United States. Some leave to study, others to work, but more and more are leaving because they see no future here,” says the island nation’s foreign minister. Some 11,000 people from Tuvalu are destined to become climate refugees.

For many, the 26th Climate Conference in Glasgow ended with euphoria. In Tuvalu, however, they interpret the results of the forum differently.”The target is to limit global warming to below 1.5 degrees. The temperature has already risen by 1.1 degrees. And we are already feeling the effects of global warming very much. So I can only imagine what warming to level 1.5 degrees will mean for us. And not only for us, but for the whole world. We

constantly see cataclysms - floods, powerful cyclones. It is sad that some leaders do not see this as a threat to everyone's personal interests" explained the minister.1.5 C - this is the acceptable level to which global warming must be limited to prevent catastrophic climate change. The limit was included in the Paris Agreement, which entered into force in 2016. Actions to deal with climate change and humanity's adaptation to it require an innovative and sustainable approach at different levels - political, economic and social.

1.2. The Age of Humans

Nearly 70 years ago, humans took over global control and so the Holocene era was displaced by the Anthropocene. A term coined in 2000 by Dutch Nobel Prize winner Paul Crutzen. According to him, the global effect of human activity is so great that it can be reasonably assumed that humanity is now living in a new geological era.

"I was at a conference where someone said something about the Holocene, the long period of relatively stable climate since the end of the last ice age," Crutzen recalled years later to the author Fred Pearce. "I suddenly thought that this was wrong. The world has changed too much. So I said: 'No, we are in the Anthropocene.

Scientists disagree on exactly when the Anthropocene began - whether with the start of the Industrial Revolution or with the dropping of the atomic bomb on Hirushima in 1945. It is accepted that the new period came with the so-called "great acceleration" that began in the mid-20th century - with the pressure of human activity on nature, large-scale production and ever-increasing consumption.

"We seek to understand how all the components of the environment are evolving globally, how they have changed, how much they have changed, and most importantly, where is the limit of change, where is the level of these diverse processes beyond which we should not go. This is why the concepts of the Anthropocene and planetary limits go hand in hand," says Prof. Crutzen Global human control over the Earth, which has a close link to global warming and climate change.

The official satetment of the United Nations Framework Convention on Climate Change (IPCC - Intergovernmental Panel on Climate Change) is that "the observed mid-20th century increase in global average temperatures is very likely due to the observed increase in anthropogenic greenhouse gas concentrations".

Controversy over whether humans are causing the so-called greenhouse effect remains in the past. Many of the greenhouse gases exist naturally in the atmosphere, but the increase in their concentration is directly related to human activity. CO2 is the most important factor contributing to global warming. According to European Commission climate data, by 2020 its concentration in the atmosphere has increased by 48% compared to pre-industrial levels (before 1750). Burning fossil fuels, cutting down forests and raising livestock are increasingly affecting the Earth's climate and temperature. The consequences of climate change are extremely serious and affect many aspects of our lives.

According to scientists who study the Anthropocene, responsibility for the environmental changes occurring are not equally distributed among countries. In systematizing the data, they continually link the processes to rich countries,

developed and developing economies. The finding is that by 2010, three quarters of the world's wealth was concentrated in developed countries, despite high rates of production and consumption in developing economies.
The temporal limit of modern research is 2050. The conclusion is that "interesting" times have already arrived. What is interesting about them is that people can model their own impact on the environment, and hence their future. Now it is man's turn to show how grown up he is for this responsibility.

1.3.How has climate change changed journalism?

The climate is changing. So is the environmental journalism. The impact of human activity on the composition of the atmosphere, global warming and hence the climate is a huge challenge not only for scientists but also for journalists.

Nature's processes are becoming increasingly large and difficult to fit into a single scientific study or journalistic article. So-called 'climate journalism' is evolving rapidly, trying not only to report on the consequences of climate change, but also to convey in language that is accessible and understandable to the general public what the causes are, what the solutions are for adapting to them, and what steps need to be taken locally and globally to ensure more climate security for generations to come.

Another, huge challenge that environmental journalists are struggling with - is fake news. The main message of the Global Media Forum in Bonn in August was that climate change and disinformation are two of this century's biggest issues. Isabelle Schläpfer from the media development organisation Internews described the disinformation about climate change as a huge problem. A report from her organisation "Covering the Planet", in which 700 journalists were surveyed, reveals a worrying trend. "Over 45% of journalists say disinformation has increased, mostly due to social media. It distorts the conversation about climate change. It takes attention away from what matters and what it means for ordinary people's lives.","Schläpfer told DW.

From the British nonprofit Center for Countering Digital Hate warn of another disturbing trend - a new form of climate change denial. 'New denial' claims now constitute 70% of all climate denial claims made on YouTube, up from 35% six years ago," It is a "substantial shift from denial of anthropogenic climate change to undermining trust in both solutions and science itself … [and] seeks to undermine solutions and delay political action.", the report of Center for Countering Digital concludes.

The solution for journalists to deal with disinformation is to use science and facts in their stories. Guided by this truth, the journalists from France Televisions launched a new broadcast in March 2024. Its purpose is to inform viewers about the direct consequences of climate change on the weather. One of the editors of the Journal Meteo Climat likes to say that the weather forecast is "a snapshot of the great climate movie" (Journal Meteo Climat). With reports, analyses, graphs and local climate focuses, the Weather Climate Journal tries to offer a real climatic

context of the weather, to understand the causes, the consequences, and provide solutions to the climate crisis. Via the climate hashtag #OnVousRépond on franceinfo.fr and the QR code, viewers are able to ask their questions to the national editorial team and scientific advisors. Every day, the climate weather journalist or one of the scientific advisors answer one of these questions (Lancement du "Journal Meteo Climat").

Conclusion

The weather forecast is just a snapshot in an overall climate pattern in which humans now have an increasingly tangible influence. So humanity is now part not only of global warming but also of climate change. And the more people learn about these processes, the more effective will be the impact of this information on their way of thinking and reacting. In this way, scientists' calls to reduce emissions and transition to a low-carbon economy will have a much better chance of being heard, understood and leading to concrete actions with sustainable, long-term results.

As a journalist who has covered environmental issues in recent years, I can report that climate change news is increasingly making headlines. But after every disaster, the feeling is that perhaps in the Age of Humans, humans will lose the battle in curbing climate change. Still, scientists have a theory that humanity can get out of the "hot pot" of the current climate model if they follow the direction of the scientific vision of environmental philosopher Glenn Albrecht, who coined the term Symbiocene. This has to be the age in which humans will live in harmony with nature. In fact, this is the best adaptation to the resources that our planet could offer. The problem is that this is a long process and a lot of generations will pay the price for the damages on nature, caused by the generations before them.

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Impacts, vulnerability and adaptation within the Climate change: Socioeconomic perspectives in Zimbabwe

Abstract:

Climate change is a reality that people face everywhere in the world. Many researchers concur that human activities are altering one of our planet's natural temperature regulators resulting in the greenhouse effect.

Moreover, what makes climate change truly unfair is that its impacts disproportionately affect those who have made the least contribution to its causes. This article's goal is to examine how climate change affects Zimbabwe's economy and society, as well as the adaptation measures used to lessen or completely eradicate its consequences.

Keywords:

Adaptation, Anthropogenic, Global Warming, Climate Change, Greenhouse Effect.

The natural world is significantly impacted by long-term changes in Earth's average temperature and weather patterns, including an increase in frequency and intensity. These changes have a range of social and economic effects on the economy, human health, and water resources, according to studies by Batten (2018) and the IPCC (2014).

Globally, the effects are unevenly distributed, with certain nations facing significantly higher dangers than others. Our society is heavily impacted by climate change because it upsets the environmental, economic, and social systems that support us. Sea level rise exacerbates and intensifies floods, which are the most frequent and deadliest consequence of climate change. Throughout the century, there have been reports of heavy precipitation up to possibly three times the historical average. According to a 2018 study, over 40 million Americans are at risk of river flooding, and over 8.6 million reside in places where storm surges from hurricanes already cause coastal flooding. In Africa El-Nino induced drought in has affected Zimbabwe and Zambia over the past decade and more recently throughout the 2024/25 agriculture season, while South Africa's Western Cape Province has been affected by floods throughout the month of July (2024), destroying infrastructure and homes.

Theoretical framework

The Anthropogenic Global Warming (AGW) theory has been put up as one of the numerous theories explaining climate change. The fundamental idea behind the AGW theory is that human activity is causing the greenhouse effect, which is one of the planet's natural temperature controllers.

Human actions, primarily the combustion of fossil fuels, have contributed greenhouse gases to the atmosphere during the industrial era. By a physical mechanism known as the greenhouse effect, increased CO2 concentrations in the atmosphere are the cause of the observed global warming. The natural greenhouse effect is exacerbated by these human-caused increases in greenhouse gas emissions.

The AGW theory's proponents contend that man-made CO2 is to blame for famines, floods, droughts, extreme weather, crop failures, extinctions of species, disease spread, ocean coral bleaching, and literally hundreds of other disasters. With rising temperatures, all of these catastrophes will occur more frequently and with greater severity.

Examining the AGW theory, its variations, and its relevance to Zimbabwe, we find that there is positive feedback, meaning that rising CO2 concentrations lead to rising temperatures, which in turn lead to rising CO2 concentrations. This causes long-term changes in Earth's average temperature, and weather patterns, including an increase in frequency and intensity, have a significant impact on the local environment.

Literature review

The Intergovernmental Panel on Climate Change (IPCC), defines climate change as a change in the climate that lasts for a long time, usually decades or longer, and may be detected (for example, by statistical tests) by variations in the mean and/or variability of its features. Chirala (2013) supports the IPCC when he describes it as a long-term change in climatological statistics, such as the typical temperature, amount of precipitation, and wind speed at a specific location and period. Climate change is simply referred to as "climate disruption," "climate chaos," and "climate crisis" by Rose et al. (2013). In light

of the opinions expressed by the aforementioned scholars this report, therefore, basically describes climate change as the variation of weather elements for better or worse over a long period of time and in a given geographical location.

Because of their unique geographic and biological characteristics, such as those of the North African countries, countries are increasingly feeling the effects of climate change. Scott (2008) believes that a nation's or region's vulnerability to climate change is primarily caused by its biophysical conditions, socioeconomic situations, and technological advancements.

For example, Giorgi (2006) declares that North Africa is vulnerable to the effects of climate change, especially the Mediterranean regions, which have been dubbed the "hot spot for climate change" because of their increased frequency, intensity, and duration of droughts.

Impact of climate change

Long-term changes in Earth's average temperature and weather patterns, including an increase in frequency and intensity, have a substantial effect on the natural world. Studies conducted by Batten (2018) and the IPCC (2014) have shown that these changes have a variety of social and economic repercussions on the economy, human health, and water resources.

Globally, the effects are unevenly distributed, with certain nations facing significantly higher dangers than others. Our society is heavily impacted by climate change because it upsets the environmental, economic, and social systems that support us. Over the world, heatwaves and droughts have increased in frequency and severity, endangering human health and leading to an increase in heat-related fatalities. The changing patterns of heat and rain have had a significant impact on food security. Crop yields are falling in Southern Europe and several regions of Africa, Asia, and South America (IPCC, 2019).

The IPCC's claim is supported by Carleton, T. A. and Hsiang, S. M. (2016), who note that most aspects of human welfare and the economy will be impacted by the physical effects of climate change. They also note that certain parts of the world will experience rising temperatures, which will negatively impact worker productivity and crop yields, increase the risk of cardiovascular and respiratory diseases, and increase mortality rates. For example, it is anticipated that rising temperatures linked to climate change may diminish the amount of land suitable for agriculture in North African countries like Morocco, Algeria, Tunisia, Libya, and Egypt, shorten growing seasons, and lower crop yields.

The physical and economic consequences of climate change vary with time and geographical location. They range from direct and indirect effects. Evidence is growing that changes in the climate system are contributing to a range of biophysical and economic impacts that are already affecting the economy. Future impacts are expected to be much larger, (IPCC, 2014).
In addition to having a significant impact on important economic sectors like agriculture, energy, and healthcare, climate change will have widespread socioeconomic repercussions that will alter the supply and demand for goods and services across the board, albeit with varying levels of intensity.

Human security, health and well-being, culture, people's capabilities, and environmental quality are just a few of the aspects of life that will be impacted

by rising temperatures and other climatic changes (such as changes in regional precipitation patterns, the water cycle, and the frequency and intensity of extreme weather events) that are not primarily based on or related to economic activity (Dell et al., 2009, 2013).

With changes in fisheries throughout human history, the effects of anthropogenic climate change on marine ecosystems are clearly becoming more pronounced. An example of changed productivity probably due to alteration of nutrient supply comes from Lake Tanganyika. Although this is a freshwater example, it is included because it illustrates the same mechanisms that affect marine systems, but the bounded nature of a lake makes it easier to show the consequences for fisheries production than can be done for marine systems with their open boundaries. A decrease in primary production by about 20% over the past 80 years can be inferred from a combination of historical and palaeolimnological data (O'Reilly et al., 2004).

In support of the Anthropogenic Global Warming theory the effects of climate climate change in Zimbabwe are seen in the massive drop in fish production in Kariba Dam (the largest man made lake in the world shared by Zimbabwe and Zambia). Media sources claim that due to the ongoing drought, Lake Karibia's water levels in Zimbabwe have drastically decreased to 13% full. The El Niño weather pattern has caused heatwaves and droughts in the Zambezi basin since the early 2010s, which has caused a significant decline in Lake Kariba's water levels.. (The Daily News, 14 April,2024).

This has had a detrimental effect on the 280-kilometer man-made Lake Kariba, which was constructed between 1955 and 1959 and supplies hydroelectric power to the Kariba South power station in Zimbabwe and the Kariba North power station in Zambia. As a result, all of these stations were forced to cease producing hydroelectric power, leaving these two nations in the dark because they rely so heavily on the power produced by the dam. Nearly all local economic activities have temporarily stopped due to the disruption in the electricity supply. Many industries have already shuttered, leaving many people without jobs. People are consequently forced to relocate to other nations in search of better prospects.

Since 2008, floods, windstorms, earthquakes, or droughts have forced over 376 million people to from their homes worldwide, with a record 32.6 million in 2022 alone, according to new data released by the Internal Displacement Monitoring Center, (International Federation of Red Cross and Red Crescent Societies, 2022).

The majority of Zimbabweans who have been forcefully moved due to floods and windstorms stay inside their country (internally displaced); but, some leave and become externally displaced. The phrase 'environmentally/climate displaced individual' is among the most recent to become widely used. Climate change can generate 'refugees' for example, because of the Tropical Cyclone Idai that hit Zimbabwe on 15 March 2019 and resulting in floods and sustained heavy rains which left a trail of destruction including shelter, lives and livelihoods. Many people were displaced internally and the growing impact of climate change (cyclone) made certain areas increasingly uninhabitable causing increase migration as individuals and communities move to other locations in order to adapt to the changing natural environment.

Most recently, the El Nino impact has caused a large portion of rural-to-urban migration, which has resulted in the growth of communities and informal settlements that are frequently constructed on unstable soil without access to

water and sanitation infrastructure. The occurrence of water-borne illnesses and other avoidable diseases has increased as a result of poor sanitation and contaminated water. For instance, cholera outbreaks have been occurring in Zimbabwe's capital city of Harare for the past 15 years.

Unpredictable weather patterns brought on by climate change include droughts, floods, more frequent and severe natural disasters, and other occurrences. According to experts, water will be the first natural resource to run out and affect people's livelihoods, leading to gender inequality. Gender inequality is inextricably related to the right and availability of clean water. If we look more closely at the provisions of the right to water and sanitation, we can observe how women are disproportionately affected when these rights are violated due to climate change. Gender academics frequently concur that women and girls are in charge of gathering water for drinking, cooking, cleaning, and maintaining personal cleanliness. But because of droughts brought on by climate change, women frequently had to go great distances to fetch water for their communities—four to five hours—carrying twenty liters of water every day across six kilometers. Girls are often kept out of school, perpetuating a cycle of poverty and illiteracy and increasing the gender gap. Furthermore, transporting water over long distances through remote places exposes women and girls to physical and sexual assault. In Chitungwiza, a dormitory town with a population of over 370,000, for instance, there are numerous reports of sexual harassment, sex for water, partisan access to water from presidential drilled boleholes, and people forced to support ruling party for them to access water.

Agriculture has also been significantly impacted by climate change, as evidenced by fluctuations in agricultural yields, high rates of livestock death and morbidity due to heat, and other erratic temperature variations. Droughts are predicted to "become longer, or more frequent, or both, in some regions and seasons" as a result of extreme weather events, which greatly increase evaporation and decrease rainfall (IPCC, 2014a). These trends and their related damages are projected to result in higher costs to the economy. Evidence is also emerging that economies do not fully recover from the macroeconomic costs of destruction but are permanently faced with lower levels of GDP and economic growth (Hsiang and Jina, 2014), although this may depend on the level of development and the stock of physical and human capital. Logically, this extends to climate-induced destruction.

Climate change adaptation

The severity of climate change's effects on the biophysical and socioeconomic environments is making adaptation measures more important in order to assist and advise global society on sustainable practices in the event of a disaster. Noble et al. (2014) and Sango and Godwell (2015) describe adaptation techniques as a set of decisions deemed necessary and advantageous in reducing or eliminating the negative impacts of climate change.
Social and structural adaptation strategies could lessen or even eradicate the effects of climate change. The construction of floating dwellings, culverts, flood levees, sea walls, and coastal protection structures are additional steps done to mitigate the consequences of floods.

In Zimbabwe, the impacts of climate change are somewhat mitigated by the introduction of new agricultural and animal varieties, conservation agriculture, hazard mapping, early warning systems, and other technical innovations. For example, the farmers in Zimbabwe adjust their schedules based on their weather observations in response to a changing environment and shifting

threats caused by climate change. This entails rescheduling field or forest activities and postponing the planting of crops until the weather warms and the rains begin. Farmers experiment with a variety of crops, including fast-maturing and drought-resistant varieties of crops. Some families have chosen to leave the flood-prone areas and move to higher ground. There is an unofficial safety net system in existence in the community that offers cash or food loans to those in need, (Ministry of Lands and Agriculture, Government of Zimbabwe, 2009).

The development of heat-tolerant crop varieties and adjustments to sowing dates to align with climate change are two adaptation measures employed in North Africa and the Mediterranean region to lessen some of the anticipated adverse effects on North African agriculture.

A study conducted between November 2010 and February 2011 in the hamlet of Farfar in northern Ghana found that residents are affected by shorter rainy seasons, warmer warm-season temperatures, and more frequent windstorms (Stanley, J., & Braimah, I. (2008)).

To adapt to this climate emergency, people are utilizing a range of coping strategies to deal with the unpredictable and changing environment. To deal with rainfall variability, researchers are experimenting with fast-maturing crops. Some households produce vegetables for sale or consumption through a method known as dry season gardening. Crops and animals can be preserved by covering roots to support plants in the event of wind or severe rain. Keeping animals indoors instead of allowing them to graze outdoors is another. Men claimed that relocating to Ghana's south in pursuit of work was a common coping strategy.
Installing boreholes, wells, and dams to provide water for cattle and gardens during the dry season is one strategy to reduce reliance on rainfall. According to the study, modifying agricultural practices—such as growing new crops like potatoes, mixed cropping, and increasing the use of drought-resistant and fast-maturing varieties—was also recommended as a key tactic to increase agricultural livelihood resilience.

Conclusion

After extensive research, it is reasonable to conclude that the Anthropogenic Global Warming model is primarily responsible for Zimbabwe's climate change. This is supported by the literature review's findings that burning fossil fuels and deforestation, among other things, have increased the amount of carbon in the atmosphere, which in turn has triggers the greenhouse effect.

A lot of climate research should be conducted in order to create new explanations for the phenomena of climate change as well as to enhance and improve current models. Additionally, ongoing and comprehensive research on this intricate phenomenon is required to identify the characteristics that could be used to reduce the likelihood of climate change susceptibility.

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How Malawian newspapers are failingto utilise Agenda Setting Theory on Environment and Climate Change Issues

Abstract:

The agenda setting theory is premised on the assumption that the mass media determine what targeted audiences think and worry about (Mtinangi, et al, 2008). Of course, media researchers Maxwell McCombs and Donald Shaw have argued that the media are not always successful at telling targeted audiences about what to think, albeit they are fairly fruitful at telling the targeted audiences issues to think about. Despite that the Malawi media is no different from other world media, in terms of agenda setting, it seems rather absurd that the six main newspapers in Malawi—namely The Daily Times, The Nation [these are daily newspapers], Malawi News and Weekend Nation (which come out on Saturday) and The Sunday Times and Nation on Sunday (which come out on Sunday)—have not been setting the agenda on climate change and environment-related issues, as evidenced by their failure to make an environment and climate change-related story the main story. This will be done by reviewing newspapers published between 1 November, 2024 and 16 November, 2024. I have chosen 1 November, 2024 to 16 November, 2024 because this is the month that the United Nations Conference of the Parties took place. As such, I expected too much focus to, for once, be on climate change-related issues. Again, the State Vice President of Malawi Michael Usi went to attend the conference and travelled back to Malawi from Baku, Azerbaijan, the venue of the conference on 16 November, 2024. Therefore, I am linking the headline story coverage to the attendance of this high-profile individual in Malawi at the conference. During the period in question, the closest an environment and climate change-related story appeared on the front page was as a support story in The Daily Times. Instead of environment and climate change-related topics, the topics that took centre

Keywords:

Agenda setting theory, Environment, Climate Change, Climate Finance, Conference of the Parties

stage and featured as headline stories were politics, energy, health, agriculture, good governance, justice, public finance, transport, and economics. This essay will, therefore, highlight the issues that were highlighted at the expense of climate change and environment-related topics.

Introduction

Can the media, especially newspapers, set the agenda and manipulate public discourse? The answer is, in the case of Malawi, yes and no.

To begin with, Malawi's leading newspapers-namely The Daily Times, The Nation, Malawi News, Weekend Nation, The Sunday Times, and Nation on Sunday—hold sway, even on social media, which has been presenting stiff competition to traditional media, in the context of this essay newspapers. What happens is that social media users take screenshots of newspaper headlines, post them on their platforms and generate debate around the topic the newspapers have zoomed in. This extends to editorial cartoons and effigies, which are shared widely on social media platforms. This shows that the agenda setting theory is applicable to Malawi, too.

At the same time, Malawi's newspapers have, despite directing targeted audiences to issues they have to be thinking about, failed to influence decision making on key issues such as fuel [petrol and diesel] price hike. From early October, 2024 to 16 November, 2024, when this essay was written, *The Nation, The Daily Times, Malawi News, Weekend Nation, Nation on Sunday and The Sunday Times* have been writing headline stories that highlight how fuel landing costs in Malawi are higher than the pump price of diesel and petrol, a factor they cite as a contributing factor to the problem of fuel scarcity in the country. However, the government, through the Malawi Energy Regulatory Authority, has not given the nod to the suggestion of raising fuel price.

Dominant topics versus environment and climate change related stories in Malawian newspapers: The case of The Daily Times, Malawi News and The Sunday Times

The lead story in The Daily Times of Friday, 1 November, 2024, was "MEC bows down to pressure" (Malimba, 2024). The story focuses on Malawi's 16 September, 2025 Local Government, Parliamentary and Presidential Elections, with the electoral body, the Malawi Electoral Commission, announcing the extension of the voter registration period. There was no climate change and environment-related story in the whole newspaper. In Malawi News of Saturday, 2 November, 2024, the headline story was "Government caught in fertiliser mess" (Maulidi, 2024). The only climate change and environment-related article in the newspaper came in the form of a centre-spread (two-page) feature on pages 10 and 15 and the title was "CoP29 must kickstart stalled progress on the lifeline that is adaptation". It was written by foreign authors Lina Ahmed and Amy Gilian Thorp, who originally published it in African Arguments. In The Sunday Times of 3 November, 2024, the headline story was "In memory of Saulos, Lucius". The closest a climate change-related story came was on page 3, titled "NFRA secures K12 billion for food purchases" (Chimjeka Matemba, 2024). In the story, the National Food Reserve Agency indicates that it has set aside that amount to procure food, further indicating that the money has been derived from the insurance payout due to El-Niño-induced drought. The African Development Bank Group and African Risk Capacity Group issued the insurance payout to the Government of Malawi. In The Daily Times of Monday, 4 November, 2024, the headline

story was “UTM strife intensifies”. There was no climate change and environment-related story in the whole newspaper. In The Daily Times of 5 November, 2024, the climate change and environment-related story was on page 3, titled “K31 billion raised for El-Niño relief”, with the Department of Disaster Management Affairs indicating that a total of K314 billion, in cash and kind, had been mobilised since march, 2024 to support households affected by El-Niño following El-Niño-induced floods and prolonged dry spells. Initially, President Lazarus Chakwera declared a state of disaster in 23 out of Malawi’s 28 districts in anticipation of a poor harvest caused by the climate event, which left over two million people in need of food assistance.

Perhaps the exception to the practice of putting climate change and environment-related stories on the peripheral is in The Daily Times of Wednesday, 6 November, 2024, where a climate change and environment-related story appears as a support story. It is titled “FAO, WFP warn of deepening hunger crisis”. The story is based on a report by the United Nations agencies Food and Agriculture Organisation and the World Food Programme, which call for urgent humanitarian action in 16 hunger hotspots, covering a total of 22 countries, including Malawi. The report, titled “Hunger hotspots FAO-WFP early warnings on acute food insecurity: November 2024 to May 2025”, attributes the food insecurity situation in Malawi to the El-Niño-induced drought experienced this year, alongside macroeconomic challenges. The hotspots are categorised into three levels of concern: ‘Hotspots of highest concern’ (category three), ‘hotspots of very high concern’ (category two) and ‘hotspots of concern’ (category one).Malawi falls into category three, alongside countries such as Burkina Faso, Niger, Somalia, Zambia and Zimbabwe. On page 6 of the same newspaper, there is an article titled ‘Malawi, partners, intensify climate adaptation campaign”.

In The Daily Times of Thursday, 7 November, 2024, climate change and environment-related stories are confined to the eight-page ‘Climate Change, Environment and Agriculture Supplement’ and the topics range from “Push for better water, forest management”, “Left behind in the storm”, “Network promotes recycling of plastics”, “Storm damages property in Nsanje”, “Battle to save freshwater”, “Sowing innovation, reaping prosperity”, “District Commissioner calls for stronger disaster preparedness”, and “The 3 kilometre trek for unsafe water”. In The Daily Times of 8 November, 2024, the environment and climate change-related story comes on pages 3 and 4, premised on efforts being made to safeguard forests that are under threat from wood sellers.

In Malawi News of 9 November, 2024, a climate change and environment-related story comes on page 11 and is titled “Mbenje’s fisheries success has reinforced regime legitimacy”. There is no environment and climate change-related story in The Sunday Times of 10 November, 2024. There is also no climate change and environment-related story in The Daily Times of 11 November, 2024. In The Daily Times of 12 November, 2024, an environment and climate change-related story appears on page 8 and is titled “Salima targets 4 million trees in green push”. In The Daily Times of 13 November, 2024, a climate change and environment-related article comes on page 3 and is titled “Act on your promises, Malawi tells rich nations”. In the story, Malawi’s Vice President Michael Usi, who attended the United Nations Climate Change Conference number 29 in Baku, Azerbaijan, reminds developed nations of their commitment, stating thus: “With many communities experiencing irreversible climate impacts, a dedicated loss and damage fund is urgently needed. This fund should be designed with flexibility to directly address the specific needs of the most affected nations and communities.” In The Daily

Times of Thursday, 14 November, 2024, the first climate change and environment-related story appears on page 2, titled “Stormy rains injure 16” (Symon, 2024) followed by a page 3 story titled “Usi challenges Malawi negotiators” (Chimjeka Matemba, 2024). And, on page 4 of the same edition, there is a story titled “Global banks pledge billions”, which actually quotes a statement from the World Bank, European Investment Bank, Asian, Inter-American and African Development Bank, who pledge to collectively provide US$120 billion of climate financing to low and middle-income countries each year. In the same newspaper, there is an eight-page Climate Change, Environment and Agriculture supplement whose story titles range from “Deforestation spurs call for other energy sources”, “Climate summit focuses on finance”, “Unearthing Malawi’s mineral wealth”, “Greening bare spaces to counter climate change”, “Agroecology sows seeds of change”, and “Rains of ruin in Mangochi”. Last but not least, in Malawi News of Saturday, 16 November, 2024, there are two stories that are premised on climate change and the environment. These are “Malawi calls for direct climate financing” on page 4 and “MANEPO wraps up El Niño relief with maize distribution in Mdeka” on page on page 9. In the first story, Malawi’s deputy minister of Local Government, Unity and Culture Owen Chomanika is urging world leaders in Baku, Azerbaijan, to provide direct support to countries such as Malawi so that they can rollout disaster recovery programmes while in the second story, a network of Malawian organisations that focus on the elderly are winding up relief food distribution efforts.

Dominant topics versus environment and climate change related stories in Malawian newspapers: The case of The Nation, Weekend Nation and Nation on Sunday

In The Nation edition of Friday, 1 November, 2024, a story related to the environment and climate change appears on page 7 and is titled “African Development Bank targets K1 trillion in climate insurance solutions” (Chitsulo, 2024), with the second one appearing on page 8, titled “People raise stone bands to tame floods”. In The Weekend Nation of Saturday, 2 November, 2024, a climate change and environment-related story appears on page 6 and is titled “Ganging up to build resilience against climate shocks”. In The Nation on Sunday edition of 3 November, 2024, a climate change and environment-related story appears on page 3 and is titled “Climate change adaptation to cost US$50 billion annually” (Chitsulo, 2024). The Nation edition of Monday, 4 November, 2024, has no story on climate change and the environment. In The Nation edition of Tuesday, 5 November, 2024, a climate change and environment-related story appears on page 8 and is titled “Conserve water bodies, Karonga people told” (Simeon Phiri, 2024). There is no climate change and environment-related story on national news pages of The Nation edition of 6 November, 2024. In The Nation edition of 7 November, 2024, there is no climate change and environment-related story on national news pages. In The Nation edition of Friday, 8 November, 2024, a climate change and environment-related story appears on page 3 and is titled “Damaged infrastructure risks further battering” (Pasungwi, 2024). In the story, climate experts warn that infrastructure that was damaged by Cyclone Freddy, which made landfall in Malawi on 11 March, 2023, risks deteriorating further as it remains unrepaired, even as Malawians await rains, which the Department of Climate Change and Meteorological Services indicated would start in mid-November 2024, especially in the southern region of Malawi.

The *Weekend Nation* edition of Saturday, 9 November, 2024, has no climate change and environment-related story, just like *The Nation on Sunday* edition of 10 November, 2024. In *The Nation edition* of Monday, 11 November, 2024, a climate change and environment-related story appears on page 9 and is

titled “People in Mchinji gear up to restore forests” (Khonje, 2024). In The Nation edition of Tuesday, 12 November, 2024, a climate change and environment-related story appears on page 7 and is titled “Usi in Baku for climate summit” (Phiri, 2024). It indicates that Malawi’s Vice President Michael Usi was in Baku, Azerbaijan, for the 29th United Nations Conference on Climate Change (CoP) 29, which opened on 11 November, 2024, and closed on 22 November, 2024. Paragraph four reads: “Malawi’s presence is important as it [Malawi] chairs the Least Developed Countries Climate Group, which represents 45 countries and 1.1 billion people”. However, despite the acknowledgement of the summit’s importance to Malawi, the story cannot even make it on the front page. In The Nation edition of Wednesday, 13 November, 2024, a climate change and environment-related story appears on page 3, and as a brief news items. It is titled “Don’t seek shelter under trees” (Gondwe, 2024). Another story appears on page 4 in the same edition and it is titled “Malawi urges global climate action support at CoP29” (Phiri & Linzie, 2024). In the story, the Vice President of Malawi Michael Usi calls on wealthy nations to “honour their pledges and provide significant funding to support climate change mitigation and adaptation efforts in Least Developed Countries reeling under the impact of climate-induced shocks”. In The Nation edition of Thursday, 14 November, 2024, a climate change and environment-related story appears on page 4 and is titled “Veep meets United Nations chief, pushes for more aid” (Phiri, 2024). It indicates that Malawi’s Vice President Michael Usi engaged a number of officials, including United Nations ones, on support, especially that focusing on climate adaptation mechanisms. One of the people he engaged with is United Nations Secretary General Antonio Guterres. In The Nation edition of Friday, 15 November, 2024, there is a page 6 pictorial that focuses on activities that took place at the Conference of the Parties number 29 in Baku, Azerbaijan (Linzie, 2024). And on page 7 of the same edition, there is an article titled “Respect women rights during climate crisis” (Linzie, 2024), in which United Nations Assistant Secretary General Ivana Zivkovic observes that climate affects women’s health, livelihoods and security “disproportionately because of gender inequality and patriarchal structures”. Last but not least, in the Weekend Nation edition of Saturday, 16 November, 2024, a climate change and environment-related story appears on page 8 and is titled “Malawi discovers priceless fossils in Cyclone Ana’s wake” (Mwalwanda, 2024). It is a feature article that better explains the term ‘blessing in disguise” as while people in Malawi consider the cyclone, which made landfall in Malawi in late January 2022, as devastating, as it, among other things, destroyed the intake structure that was being constructed under the Shire Valley Transformation Programme, experts have discovered “invaluable plant and bones at Kapichira in Chikwawa District”. In other words, by sweeping away people’s crops, killing people and destroying structures, the cyclone ended up exposing what scientists believe is hidden wealth in some of the areas it affected.

Summary of topics that dominated front pages at The Daily Times, The Nation, Malawi News, Weekend Nation, The Sunday Times and Nation on Sunday

At Nation Publications Limited newspapers—namely *The Nation, Weekend Nation and Nation on Sunday* - the following topics dominated as follows:

DOMINATING THEME/TOPIC IN THENATION, WEEKEND NATION AND NATION ON SUNDAY	NUMBER OF HEADLINE STORIES FROM 1 NOVEMBER, 2024 TO 16 NOVEMBER, 2024
Politics	7 (seven)
Energy	2 (two)
Health	2 (two)
Agriculture	1 (one)
Good Governance	1 (one)
Justice	1 (one)
Public finance	1 (one)
Transport	1 (one)

At The Times Group - which publishes The Daily Times, Malawi News and The Sunday Times - the following topics dominated as follows:

DOMINATING THEME/TOPIC IN THEDAILY TIMES, MALAWI NEWS AND THE SUNDAY TIMES	NUMBER OF HEADLINE STORIESFROM 1 NOVEMBER, 2024 TO 16 NOVEMBER, 2024
Politics	9 (nine)
Agriculture	2 (two)
Economics	1 (one)
Good Governance	1 (one)
Transport	1 (one)
Public finance	1 (one)
Justice	1 (one)

In short, political issues dominated front pages, followed by agriculture, energy, and health.

At The Nation, Weekend Nation and Nation on Sunday, the headline stories were as follows: “Malawi Energy Regulatory timid on fuel stability”, “Chakwera could face impeachment”, “Malnutrition massacre: 674 children die in six districts”, “Convention will go ahead—UTM Party”, “Plane crash probe starts”, “Health budget gets too sickly”, “Affordable Inputs Programme paralysed”, “Erosion of trust: Survey shows loss of confidence in Judiciary, Parliament, presidency”, “K78 billion bill chokes Electricity Supply Corporation of Malawi”, “Justice so lazy, it hurts”, “Fuel scarcity squeezes ministries, departments, agencies”, “Usi out of UTM race”, “Parties defiant on Malawi Electoral Commission demonstrations”, “Police turn spectators”, “Police under fire on demonstrations”, and “Pure solidarity: Joyce Banda, Peter Mutharika, Bakili Muluzi condemn violence”.

At The Daily Times, Malawi News and The Sunday Times, the headline stories were as follows: “Malawi Electoral Commission bows to pressure: Extends voter registration deadline”, “Government caught in fertiliser mess”, “In memory of Saulos Chilima, Lucius Banda”, “UTM Party strife intensifies”, “Michael Usi fails to file nomination papers”, “Chisale, State clash in court”, “Trump wins US election”, “Abolish vice presidency”, “Wasteful: Ministry of Tourism spends K100 million on air tickets”, “Bone, skull crushers on the loose”, “Affordable Inputs Programme at risk”, “Usi trashes UTM indaba”, “Malawi Electoral Commission raises poll fees”, “Thugs foil demos in Lilongwe”, “Reserve Bank of Malawi tightens grip on forex”, and “Demos thuggery riles ex-leaders”.

How my career can benefit from climate change, environment reporting

My career would benefit immensely if I were to specialise in reporting on climate change issues. To begin with, doing so would help me fill an existing gap, as Malawian newspapers do not have climate change desks, let alone dedicated personnel to climate change-related issues. As a result, there are no vernacular terms for terms associated with climate change, save for the word climate change itself, which is translated as kusintha kwa nyengo in the vernacular Chichewa, which is the main local language in Malawi. The career would get a boost as there is immense support from government agencies, coupled with editors' and public support, creating a favourable condition for the thriving of climate change reporting in Malawi.

Malawi is a country located in Southern Africa, east of Zambia, west and north of Mozambique (The World Factbook). The country has been suffering from climate change-related extreme events, including Tropical Cyclone Freddy, which made landfall in Malawi on March 11, 2023 and caused untold suffering, with a Post-Disaster Needs Assessment Report estimating that 109,625 hectares of crops for around 308,000 farming families were washed away, with over 288,000 houses damaged and total damage and losses estimated at $220.2 million (Chirombo, 2024). This, and other climate change related disasters such as storms and cyclones Idai, Kenneth, Gombe, and Ana have led to a greater realisation of the danger at hand, with community members in areas such as Soche Hill in Blantyre still struggling to recover from the damage suffered (Ponje, 2024: 1). Such events have led to local support, editors' backing and public appreciation of responses to disasters that are induced by climate change. A manifestation of this support is some newspapers' decision to introduce supplements on the subject.

To begin with, local support for climate change response programmes is backed up by research, with the majority of respondents saying Malawians indicating that they are feeling the pinch of climate (Kayuni & Chunga, 2023). The local populace's views are not surprising considering that, according to Kayuni & Chunga (2023), the country is among countries that are "most vulnerable" to climate change.

Again, there is local support for climate change programmes from local and multi-national organisations, foreign governments, and others, support that increased after the country launched the Updated Malawi's Strategy on Climate Learning (UNCC: Learn: 2021), showing its commitment to joining hands with stakeholders in addressing climate change-related problems. In the strategy, the government indicates that it wants the country to be a knowledge-driven climate change resilient country by 2030. To emphasise its seriousness, the government changed the name of the Department of Meteorological Services to incorporate climate change; thus, it is now known as the Department of Climate Change and Meteorological Services, which is mandated to monitor, predict and provide information and weather and climate, with a vision to ensure that Malawi is "A Responsive Nation to Weather and Climate Change Impacts" (Department of Climate Change and Meteorological Services). It also introduced a Ministry of Climate Change.

In addition, the government launched the National Climate Change Policy, which it uses to mobilise support towards local climate change response efforts from both local institutions and foreign ones. The policy reads in part: "In recognition of the country's vulnerability to adverse effects of climate change, the Government of Malawi has taken important steps to address climate change issues by signing and ratifying the UNFCCC and its Kyoto Protocol" (Government of Malawi: 2016: 4).

Through such documents, organisations such as Trócaire, which indicates that "In Malawi climate change is a threat to economic growth, long-term prosperity, as well as the livelihoods of an already vulnerable population" (Trocaire).

As part of efforts to increase public awareness on climate change, especially in secondary schools, Malawi's Ministry of Education launched the Climate Change Sourcebook for Secondary School Teachers, aimed at supporting teachers in imparting climate change messages. It was developed by the Malawi Institute of Education, with support from UN CC:Learn and the United Nations Development Programme. UN CC:Learn is a partnership of more than 30 multilateral organisations supporting countries that are interested in designing and implementing systematic, recurrent and results-oriented climate change learning. At the global level, the partnership supports knowledge-sharing, promotes the development of common climate change learning materials, and coordinates learning interventions through a collaboration of United Nations agencies and other partners (United Nations Institute for Training and Research, 2015).

On the other hand, Malawian editors have shown support towards climate change reporting through editorials. For instance, on 10 October, 2023, The Daily Times carried a climate change-related editorial titled 'Climate change information processing problematic'.

In addition, editors have shown support for climate change reporting, as evidenced by the launch of the 'Climate Change, Environment & Agriculture' supplement on 8 August, 2024. The supplement was launched in The Daily Times, the flagship newspaper for The Times Group, which also publishes Malawi News and The Sunday Times. This is an apparently clear message of the seriousness with which the publication, which is Malawi's "oldest newspaper", "founded as the monthly Central African Planter in 1895" (Muck Rack), treats climate change issues. In its first ever editorial for the supplement, the publication declared:

"In recent years, Malawi has been experiencing the devastating impacts of climate change, which intersect with other areas such as agriculture and health. We understand that these issues are complex and multifaceted, making them difficult for the general public to fully grasp. Therefore, this platform will provide comprehensive information on these topics, contributed by our own journalists and experts in the fields…." .

Therefore, the editors have already expressed commitment to playing a rightful role in helping the reader make informed decisions on climate change issues. Fortunately for the Malawi media, there is public support. For instance, the United States Agency for International Development, the British High Commission to Malawi, among others, have been funding the Green Media Awards, which they fund through Association of Environmental Journalists (AEJ) in Malawi to promote climate change and environmental reporting in the local media. In awards held on Friday, August 9, 2024, for instance, The Times Group's reporter Thomas Kachere emerged winner in the categories of Sustainable Energy and Green Television Documentary (The Daily Times, 2024). Furthermore, the Department of Climate Change and Meteorological Services offers public support by offering timely forecasts to radio, television, newspaper, magazine, and online news platforms, thereby giving targeted audiences the opportunity to make informed decisions on weather and climate issues.

In addition, the department has a strategic working relationship with Journalists for Climate Change [Malawi], through which it offers training in weather and climate issues to local journalists, thereby increasing coverage of such issues. The department uses taxpayers' money, in the form of budgetary allocations it gets from the government, to fund such training, which is a mark of public support.

Conclusion

The logical conclusion is that the Malawi media uses the agenda setting theory, but only to some extent, as newspapers such as The Daily Times, The Nation, Malawi News, Weekend Nation, The Sunday Times and Nation on Sunday seem to be swayed by events on the political arena other than using their best judgement to gauge whether it is political stories that are largely based on sensationalism and climate change and environment-related ones, which are often backed up by science, that have a lasting impact on targeted audiences.

From the evidence available, through the review of the six leading newspapers in Malawi, what comes out clearly is the following:

- Politics sells. This is an old adage in Malawian newspapers, especially at The Times Group, where I work. No wonder, there were nine headline stories that focused on politics from 1 November, 2024 to 16 November, 2024, even as the United Nations Climate Conference took place in Baku, Azerbaijan, where Malawi's Vice President Michael Usi was in attendance. During the period in question, the closest a climate change and environment-related story came on the front page was when it appeared as a support story in The Daily Times of Wednesday, 6 November, 2024. It was titled 'FAO, WFP warn of deepening hunger crisis".

- Agriculture, energy, and health issues were ranked higher than climate change and environment-related stories. At The Daily Times, Malawi News and The Sunday Times, climate change and environment-related stories did not even feature among the seven dominant themes/topics. At The Nation, Weekend Nation and Nation on Sunday, climate change and environment-related stories did not even feature among the eight dominant themes/topics

In summary, there is a long way to go before Malawian newspapers exercise their agenda setting role on climate change and environment-related topics, a development that presents an opportunity for further engagement with media practitioners in Malawi. In addition, there is a need for in-depth research on why those in traditional media - in this case newspapers - in Malawi do not want to accord environment and climate change-related issues the space they deserve considering that there are truckloads of literature materials on science subjects.

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Climate change does not need a passport to enter any country in the world. How we should act in our own country locally to live hand by hand with the world globally to save the planet?

Abstract:

Climate change is our new reality. There is no place safe, because Earth's system components are interconnected and interdependent.

The increase in the concentration of carbon dioxide in the atmosphere is the most important indicator of the climate crisis, as its evolution is closely followed by that of the average global temperatures. Both cause chain effects on the earth's climate, reverberating at local, regional and global levels.

Understanding the functioning of Earth's system and how each local change propagates is essential to realizing the importance of taking urgent and drastic actions.

Science told us that there is only one solution: the drastic reduction of greenhouse emissions, especially carbon dioxide, the main cause of global warming and degradation of marine and terrestrial ecosystems.

Keywords:

Climate change, global warming, climate crisis, carbon dioxide, greenhouse gas,climate education, climate action, adaptation, mitigation, state of climate

1. Introduction

1.1 Earth's systems

The Earth is a complex system, whose components interact with and influence one another, interconnected and interdependent. The five major components are: atmosphere, hydrosphere, cryosphere, lithosphere and biosphere. (WMO, March 20, 2024) Solar radiation ensures the functioning of the climate system. The non-reflected radiant energy determines the atmospheric circulation, which is also influenced by the rotation of the Earth around its axis, through the Coriolis effect.

Many processes - radiative, chemical and dynamic - take place in the atmosphere. (Roxana Bojariu et al, 2021) The oceans, which cover about 71% of the Earth's surface, not only absorb about a quarter of the carbon dioxide produced by humans, but also absorb 90% of excess heat. The ocean is the regulator of terrestrial climate; therefore, ocean warming can be seen as a sentinel of global warming.

The planetary ocean is the component responsible for the transport of energy within the climate system. It is also the main water reservoir, as it contains approximately 97% of all the water on Earth. At the same time, it is a thermal reservoir, acting as the main climate regulator. Atmospheric processes are strongly influenced by temperature variations at the surface of the ocean.
The interaction between the atmosphere and the ocean largely determines the evolution of the terrestrial climate system.

In the Earth's system a number of positive and negative feedback processes are produced. For example, positive feedback is what happens with water vapors in the atmosphere: higher temperatures cause an increase of water vapors in the earth's atmosphere, which causes additional warming, leading to even more water vapors, amplifying the initial warming. (Roxana Bojariu et al, 2021).

1.2 What is Climate Change

The World Meteorological Organization defines climate as "the synthesis of average weather conditions for a given location over a long period of time, ranging from months to thousands or millions of years". The WHO uses a period of 30 of years to determine the average climate. (WMO, 2024) Earth's climate has undergone many changes throughout the geological history of the planet. Natural climate changes were determined by natural causes such as volcanic activity or the variability of solar activity. They influenced the climate system and implicitly terrestrial life. Anthropogenic climate change, however, represents the increase in the atmospheric concentration of greenhouse gases because of human activities, especially the use of fossil fuels.

1.3 What is the Greenhouse Effect

Greenhouse gases are gases that capture solar heat and keep it close to the surface: water vapor, carbon dioxide, methane, nitrogen oxide, ozone and compounds of carbon with chlorine and fluorine. These gases ensure the existence of the necessary conditions for life on Earth. This is the natural greenhouse effect. Water vapors have a strong greenhouse gas effect, but they do not condens and last just for few days in the atmosphere. Global warming causes also the melting of permafrost, which leads to additional emissions of

methane, another strong greenhouse gas. The anthropogenic greenhouse effect is mainly related to carbon dioxide, which persists in the atmosphere for hundreds or even thousands of years. The increase in carbon dioxide concentration in the atmosphere is the determining factor when we talk about global warming. A simplistic explanation of the phenomenon of heat capture by the Earth's atmosphere was made in 1824, by the French mathematician and physicist Joseph Fourier who compared the Earth to a box with a glass cover. Several years later, in 1859, John Tyndall concluded that changes in the concentration of certain gases in the atmosphere could produce changes of the climate. In 1896, the Swedish chemist Svante Arrhenius published the first calculation of global warming caused by human carbon dioxide emissions. (Scientific American, 2024).

In 1975, the American geochemist Wallace Broecker predicted that a pronounced global warming will occur due to the increase of atmospheric carbon dioxide concentration and that the average global temperatures will rise. (Gariwo, 2019).

In 1988, American scientist James Hansen talked about global climate changes, claiming that „the temperature changes are sufficiently large to have major impacts on people and other parts of the biosphere, as shown by computed changes in the frequency of extreme events and comparison with previous climate trends." (Hansen JE & I. Fung & Andrew Lacis & D. Rind & S. Lebedeff. & R. Ruedy & Gary Russell 1988)

1.4 Carbon dioxide concentration measurement

Measurements of atmospheric carbon dioxide concentration were first taken by C. David Keeling of Scripps Institution of Oceanography in March 1958. In May 1974, NOAA began its own measurements in parallel with those at Scripps. (GML). Today, global monitoring of greenhouse gases is crucial to understand where Earth's climate is now and where we are headed. In June 2024, an implementation plan of UN Global Atmosphere Watch was approved. The goal is to strengthen the global monitoring of greenhouse gases. In the first phase, The Global Greenhouse Gas Watch will focus on the three most important greenhouse gases due to human activities: carbon dioxide, methane, nitrogen oxide. (WMO, June 11, 2024).

2. State of Globale Climate

2.1 Year 2023

Since 2004, WMO has been publishing The Greenhouse Gas Bulletin annually. According to the latest report, as of October 2024, the carbon dioxide concentration in the atmosphere reached a new record level of 420.0 parts per million in 2023, compared to 377.1 ppm reported in the first edition, in 2004. An increase of 11.4 % in only 20 years. (WMO, Oct. 24, 2024).

Credit: WMO
WMO experts specify that greenhouse gases level in the atmosphere will not decrease as long as the emissions continue and will lead to an increase in the global temperature. Unfortunately, given that the carbon dioxide currently accumulated in the atmosphere will persist for hundreds of years, the rise in global average temperature will continue for several decades - even if emissions are rapidly reduced to net zero. (WMO, Oct 28, 2024)

2.2 Year 2024

Credit: Copernicus Climate Change Service /ECMWF According to the latest bulletin of the Copernicus Climate Change Service, 2024 will almost certainly be the warmest year in the ERA5 reanalysis dataset. For the first 10 months of the year, the average global temperature anomaly was 0.71 C above the 1991-2020 average, the largest on record for this period. Furthermore, if the anomaly does not decrease to near zero in November and December, it is virtually certain that 2024 will be the first year in which the annual temperature exceeds the pre-industrial level by more than 1.5 C. (Copernicus Climate Change Service, 2024)

3. Climate change does not need a passport

Extreme heat waves, storms, droughts, floods - these are the undeniable effects of human induced climate change. But there are also less visible consequences, with global and long-term impact and with possible cascading effects on the Earth's climate.

3.1 Glaciers melting

Melting polar ice has not only local short-term effects, but possibly even long-distance and long-term effects. A recent study by a group of Australian and American researchers shows that as global warming accelerates the melting of Antarctic ice, an ever-increasing volume of fresh water reaches the ocean, reducing the salinity and density of surface water and diminishing the downward flow to the bottom of the sea. Off the coast of Antarctica, cold salty water descends to a depth of over 4,000 meters, and from there oxygen and nutrients are carried by currents northward to the Indian, Pacific and Atlantic Oceans. The same phenomenon takes place at the North Pole, near Greenland. The study shows that at current levels of greenhouse gas emissions, the circulation of Antarctic deep water could slow twice as much as the North Atlantic currents. In addition, the global ocean will no longer be able to absorb as much carbon dioxide as its upper layers become more stratified, causing more carbon dioxide to remain in the atmosphere. These results demonstrate that changes occurring in one location on the globe can have a global impact. (Matthew England, Adele Morrison, Andy Hogg, Qian Li, Steve Rintoul, 2023).

The reduction of the salinity of the water also has repercussions at a biological level: for example, algaes, whose disappearance causes a domino effect up the entire food chain, from fish populations to penguins and seals.
Another consequence of glaciers melting is the rise of the global sea level, already visible from the coasts of northern Europe to the small islands in the Pacific, whose inhabitants see themselves in the situation of becoming climate refugees.

3.2 Extreme Weather Events

Recently, severe floods ravaged Spain and left behind a large number of victims and significant damage. World Weather Attribution elaborated a quick review study and the analysis shows that in the last 75 years, the maximum daily level of precipitation in central and southeastern Spain in the September-December season has increased in intensity by 12%. An important factor related to this increased intensity of precipitation is the temperature anomaly of the Mediterranean Sea: 2-3 degrees Celsius above the usual value for this period of the year, another effect of global warming. The three analysed datasets indicate that heavy 1-day rainfall events, as intense as the one observed,

are about 12% more intense and about twice as likely in today's climate, that is 1.3°C warmer than it would have been in the cooler preindustrial climate without human-caused warming." (World Weather Attribution, 2024) The key message is that the increase in rainfall intensity would not have been possible in the absence of climate change, which is, without a doubt, an effect of the increase in greenhouse gas emissions due to human activities. For every degree Celsius of warming, the water-holding capacity of the atmosphere increases by about 7%. (Kevin E. Trenberth, Aiguo Dai, Roy M. Rasmussen and David B. Parsons, 2003) According to Copernicus Climate Change Service, in October 2024, wetter-than-usual conditions were recorded in several regions of the globe, such as parts of China, Taiwan and the United States, while drier-than-usual conditions were recorded in the US, Australia, southern Africa, Madagascar, parts of Argentina and Chile. (Copernicus Climate Change Service, 2024).

3.3 The Biodiversity Crisis

Another ramification of the climate crisis is a biodiversity crisis. Three-quarters of the terrestrial environment and about 66% of the marine environment have been significantly modified by human actions. Up to 1 million species of animals and plants are now threatened with extinction. Even in the case of a global warming of 1.5 to 2 degrees Celsius, most terrestrial species are expected to shrink drastically. (IPBES, 2019). The increase of greenhouse gas emissions caused by human activities has alarming consequences on marine ecosystems. Ocean acidification is one of the nine tipping points considered as "planetary limits", possibly to be exceeded "in the near future", according to a recent report. (Potsdam Institute for Climate Impact Research, 2024). The term ocean acidification refers to changes in water chemistry. The absoption of carbon dioxide from the atmosphere causes, over a longer period of time, a reduction in the water's pH, which means an increase of the water's acidity. The most significant consequence of this is the mass bleaching of corals globally.

The higher water acidity also affects other aquatic organisms which show a decrease in the rate of calcification and/or an increase in dissolution when exposed to acidifying water conditions. (University of Plymouth) The latest Copernicus report on the state of the oceans informed that the acidity of ocean waters has increased by 30% since 1985. Water acidity has a corrosive effect on the skeleton and shell of corals and mollusk. (Copernicus Marine Service, 2024).

These changes in ocean water chemistry can also affect the behavior of other marine organisms. According to American scientists, the ability of certain fish to detect predators decreases in more acidic waters. Thus, in the end, the entire food cycle may be at risk. (NOAA)

4. How to solve the Climate Crisis

The world scientific community unanimously agrees that the only solution is the rapid reduc-tion of emissions resulting from human activities, especially those of carbon dioxide. Referring to the last bulletin of Copernicus Climate Change Service, which shows that 2024 could very likely be the warmest year on record, Samantha Burgess, Deputy Director of the Copernicus Climate Change Service (C3S) states:

This marks a new milestone in global temperature records and should serve as a catalyst to raise ambition for the upcoming Climate Change Conferen-

ce, COP29.") (Copernicus Climate Change Service, 2024). The most recent UNEP calls to an unprecedented global mobilization of renewable energy, forest protection and other measures in order to move the planet off its current path leading to a catastrophic 3.1C temperature rise. Our planet is "running out of time", it can no longer afford additional "hot air", the report says, and an urgent action at the COP 29 summit in November is needed. The target must be a collective commitment to reduce greenhouse gas emissions by 42% per year by 2030 and by 57% by 2035. (UNEP, 2024).

This may sound difficult to achieve, but it is not without precendent.

"The Montreal Protocol is one of the most important and successful global environmental treaties" according to David Fahey, director of NOAA's Chemical Sciences Laboratory and co-chair of the 2022 Montreal Protocol Scientific Assessment Panel. (National Oceanic and Atmospheric Administration, 2023). In May 1985, three scientists from the British Antarctic Survey announced the discovery of a hole in the ozone layer. Soon it became obvious that this was an extremely serious problem for our planet. As such, in September 1987, 200 countries and organizations around the world signed the Montreal Protocol, which regulates the production and consumption of nearly 100 man-made chemicals that deplete the ozone layer. The result was a significant recovery of the protective ozone layer in the upper stratosphere. If current policies remain in place, levels are expected to return to 1980 levels by 2040. Over Antarctica, recovery is expected around 2066 and over the Arctic by 2045. The Montreal Protocol is the proof that united action could solve a global environmental problem.

Conclusion

If there are no severe weather events or visible environmental changes in the place where we live, this does not mean that it is not happening elsewhere. The atmosphere cover the entire planet and the high carbon dioxide concentration affects every place on Earth.

In order to solve the current climate crisis, actions must start at individual and regional level and become globally and must take place simultaneously and be doubled by measures to adapt to our new climate reality.

Just like other countries, Romania is also strongly feeling the effects of climate change. In the last decades, heat waves have intensified, areas affected by drought have increased and severe storms are becoming more and more frequent. Romania's national policy to reduce greenhouse gas emissions follows the European approach as well as the adoption of policies and measures at the national level in sectors like Industrial Processes, Solvents and the use of other products, Agriculture, Land Use, Land Use Change and Forestry, Waste management. Regarding the energy sector, a significant increase in the capacities of renewable energies (wind and solar) and also nuclear energy is foreseen until 2050. (National Energy Strategy, National Integrated Energy-Climate Change Plan; Romania's Long-Term Strategy for Reducing Greenhouse Gas Emissions). At individual level we must consider a change of our lifestyle - reduce the use of personal vehicles as a means of transportation, energy saving and the use of green energy sources, reducing the carbon footprint. Very important is also climate education.

We must realize that there is no "planet B" for us, at least for the moment, and is in our hands to solve this climate crisis.

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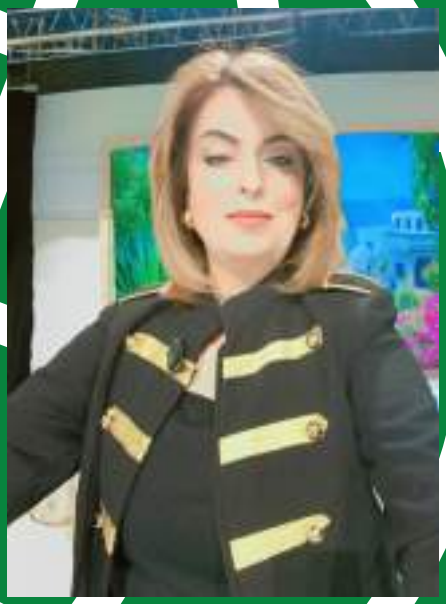

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Country
Tunisia

Reflections and Vision on Reporting Climate Change

Abstract:

The Reporting Climate Change program has profoundly reshaped my approach to journalism, particularly regarding environmental issues. Through the six modules, I have gained a deeper understanding of how climate change intersects with biodiversity, economic systems, renewable energy, and public engagement. This knowledge has not only informed my professional work but also expanded my capacity to address one of the most pressing challenges of our time.

As a Tunisian journalist, I have sought to translate these insights into action by producing a TV program focused on climate change. The program aims to provide viewers with accessible information and practical advice on how climate change affects their lives and how they can contribute to mitigation and adaptation efforts. This essay synthesizes my learnings from the program, outlines my vision for future reporting, and proposes ways to bridge gaps between information dissemination and public action.

Keywords:

Recreational fishing,
Marine Ecosystems,
Ghana, biodiversity,
Overfishing,
Coastal management,
Sustainability,
Fish stocks, Habitat degradation,
Conservation.

Section 1: Climate Change and Biodiversity

The Mediterranean region is one of the world's biodiversity hotspots, yet it is increasingly vulnerable to climate change. Rising temperatures have disrupted ecosystems, forcing species like the European Roller and Iberian lynx to migrate. At the same time, invasive species such as lionfish and red swamp crayfish are further destabilizing the ecological balance. These changes are not just ecological but economic and cultural, affecting agriculture, fishing, and even tourism.
In my TV program, I emphasized the importance of biodiversity, dedicating segments to local and regional examples. By showcasing the interconnectedness of ecosystems and human livelihoods, I aim to foster a sense of stewardship among viewers. For example, a segment on how invasive species harm Mediterranean fisheries resonated with local fishermen, who shared their experiences on camera. This blend of expert insights and personal narratives highlights the tangible impacts of biodiversity loss, making the issue more relatable to the audience.

Section 2: Empowering Action Through Journalism

Journalists have a unique role in shaping public discourse on climate change. The essay on engaging readers in climate action highlighted the need for solution-oriented reporting that connects global challenges to local realities. This principle has guided my approach in both my reporting and the development of my TV program.
By focusing on relatable stories and actionable solutions, I strive to empower my audience. For instance, one episode explored how urban gardens can combat rising temperatures and food insecurity in Tunis. Viewers were not only informed about the benefits but were also provided with step-by-step guides to start their gardens. Such practical advice, coupled with success stories, fosters a sense of agency and encourages behavioral change.
Targeting youth has been a priority in my reporting. As the generation that will inherit the consequences of climate change, young people are central to climate action. Through

interactive segments and social media engagement, I've sought to inspire them to lead grassroots initiatives and advocate for systemic change.

Section 3: Localized Impacts of Climate Change

Climate change's economic impacts are acutely felt in regions like Tunisia, where agriculture forms a cornerstone of the economy. Prolonged droughts, rising temperatures, and erratic rainfall patterns have drastically reduced crop yields, threatening food security and exacerbating economic inequalities. These local challenges ripple into global markets, highlighting the interconnectedness of climate and economic stability.
Through my TV program, I've reported extensively on these issues, focusing on how climate change disrupts rural livelihoods. One memorable episode featured interviews with farmers who shared their struggles with water scarcity and shifting planting cycles. By humanizing these challenges, I aim to bridge the gap between policy discussions and real-world impacts. Addressing these localized impacts requires a multi-pronged approach, combining local adaptation measures with international cooperation. My reporting emphasizes the need for policy solutions that prioritize equity, such as subsidies for sustainable farming practices and investments in water-efficient technologies. These stories not only inform but also advocate for systemic solutions that address the root causes of vulnerability.

Section 4: Energy Transition as a Climate Solution

Tunisia's energy landscape presents both challenges and opportunities. With 90% of its electricity derived from imported natural gas, the country faces significant vulnerabilities. However, Tunisia also has immense potential for renewable energy, particularly solar power. Morocco's Noor solar project serves as a compelling example of how North African nations can lead in clean energy innovation.
In my TV program, I've covered Tunisia's renewable energy transition extensively, blending technical analysis with human stories. For example, one episode explored how rooftop solar panels could democratize energy access while reducing greenhouse gas emissions. By interviewing energy experts, policymakers, and local residents, I provided a holistic view of the challenges and opportunities in this transition.
Decentralized energy systems, international partnerships, and streamlined regulations are recurring themes in my reporting. These solutions not only address environmental concerns but also create economic opportunities and enhance energy security. Highlighting these co- benefits is crucial for building public and political support for renewable energy initiatives.

Section 5: Policy Frameworks and Green Investments

Effective policy frameworks are essential for aligning economic activities with environmental goals. The EU's Green Taxonomy exemplifies how clear criteria can combat greenwashing and drive sustainable investments. However, its implementation challenges, particularly for small and medium-sized enterprises, offer valuable lessons for Tunisia.
My TV program has explored how international frameworks like the Green Taxonomy can inspire local action. By simplifying complex policies and explaining their relevance to everyday life, I aim to make such frameworks accessible to a broader audience. For instance, a segment on green financing highlighted how Tunisian entrepreneurs could access

international funds for sustainable projects. This approach not only informs but also empowers individuals to leverage policy tools for climate action.

Conclusion: My Vision and Future Activities

Reflecting on this program, I see my role as a journalist not just as a storyteller but as a catalyst for change. My vision is to create narratives that amplify marginalized voices, highlight innovative solutions, and hold systems accountable. The production of my TV program has been a first step toward this goal, providing a platform for diverse perspectives and actionable advice.
Looking ahead, I plan to expand the program into a multimedia initiative, incorporating data visualizations, interactive features, and community-driven content. Workshops for young climate communicators are also on the horizon, aiming to equip the next generation with the skills to report on climate change effectively. Additionally, I will advocate for media platforms to prioritize climate reporting, ensuring that this critical issue remains in the spotlight.
Ultimately, my goal is to contribute to a media landscape that not only informs but also inspires action. By fostering collaboration, innovation, and inclusivity, I aim to play a part in the global effort to address climate change, one story at a time.

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  This book provides a stark look at the potential impacts of climate change, making it a compelling read for understanding the urgency of the issue.

- "This Changes Everything: Capitalism vs. The Climate" by Naomi Klein
  Klein explores the intersection of climate change and economic systems, offering a comprehensive analysis of the challenges and potential solutions.

- "Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming" edited by Paul Hawken
  This book outlines practical solutions for reversing global warming, making it a great resource for readers looking for actionable steps.

Websites and Online Platforms

- Climate Reality Project
  Website: www.climaterealityproject.org
  Carbon Brief
  Website: www.carbonbrief.org

- Project Drawdown
  Website: www.drawdown.org

Educational Courses and Workshops

- Coursera – "Climate Change and Health" by Yale University

- TedX – "Making Sense of Climate Science Denial" by the University of Queensland.

- The Climate Reality Leadership Corps Training


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The Role of Urban Forests in Climate Change Mitigation: Review of Global Policies and Practices

Abstract:

The notion of 'urban forest' refers to all trees that grow within urban areas and these trees pays a significant role in providing towns and cities ecological services. The infrastructure of Urban Green Spaces(UGS) is currently receiving increased attention due to its importance for cities, when they are developed, developing or in the future. Sustainable development nevertheless requires sustained urbanization and green planning for cities is seen as a successful defense against impending climate change concerns.

Keywords:

Climate Change, Biodiversity, Global Warming and the Mediterranean Region.

Introduction

Climate change is now recognized as one of the biggest problems the world is facing, posing a potential threat to the environment and almost all aspects of human life. Since the United Nations Framework Convention on Climate Change in 1992, many efforts have been made to mitigate climate change, with no considerable results. According to climate change projections, temperatures will continue to rise, and extreme weather events will become more frequent, prolonged, and intense. Reflecting these concerns, the 2015 Paris Agreement was adopted as the cornerstone for reducing the impact of climate change, aiming to limit global warming below 2 °C and even keep the temperature rise below 1.5 °C. To achieve this international goal, focused mitigation actions will be required.

Climate change has a strong impact on urban forests, enhancing their growth but also posing risks to them. Conversely, forests can mitigate climate change, as they have a considerable impact on global surface temperatures through their influence on the land–atmosphere energy exchange and the absorption of vast amounts of CO2 through photosynthesis. (Psistaki et al., 2024) Consequently, urban forests and trees, afforestation and reforestation have become integral components of climate change mitigation strategies worldwide.

This essay aims to summarize the cutting-edge knowledge on the role of urban forests in climate change mitigation and review selected global policies and practices with special look at how urban forests impacts water access; how non-governmental organisations contribute with urban forests projects; government policies on urban forests, some regenerative policies; and some climate actions and policies worldwide as climate change ‘does not need a passport to enter any country’.

Urban Forests as a Nature-based Solution to Climate change In recent years,urban trees have gotten a lot of attention as a top climate change solution. And while that remains true, in order for collective climate efforts to succeed, reforestation needs to happen alongside other critical actions—such as reducing global emissions and protecting urban existing forests. That said, planting the right trees in the right place, at the right time, and for the right reasons, is a powerful Nature-based Solution. Urban forests combat climate change by absorbing carbon dioxide from the atmosphere and storing it in their biomass. According to Global Forest Review, the world’s existing forests absorb a net 7.6 billion metric tons of carbon from the atmosphere each year - equivalent to about 30% of what is emitted every year. Urban trees also remove many harmful airborne pollutants that are associated with climate. These include gaseous pollutants such as nitrogen dioxide, carbon monoxide, smoke, dust and other chemicals. Also, trees regulate temperatures in urban landscapes. This reduces the amount of energy that is needed to maintain safe indoor temperatures.(Weeden 2014) Again, urban forests protects biodiversity. Urban forests can be useful both in mitigating climate change and in helping cities adapt to higher temperatures and other impacts of climate change. Urban trees reduce the amount of greenhouse gases in the air by sequestering carbon dioxide and by reducing the amount of energy needed to heat and cool buildings. These roles can be quantified at the scale of individual trees or entire cities (McPherson et al. 2005) and also for states (McPherson and Simpson 2003). The overall effect of urban forests is to cool the local environment during summer. Trees provide shade that keeps some sunlight from reaching the surface below their canopies. When trees shade buildings, this interception can reduce summer demand for air conditioning, which in many

cities is powered by greenhouse-gas-emitting fossil fuels, such as natural gas or coal. Shade around air-conditioning units can reduce energy use by partially pre-cooling air before it enters the building. Urban Forests and water access Urban forests can improve urban stormwater management and reduce the hazards posed by flooding while also providing other environmental and cultural benefits. In many cities, contaminated drinking water causes severe health issues like diarrhea and dysentery. Reliable water treatment, however, can be costly. Forests in nearby watersheds can protect water supplies from pollutants, prevent soil erosion and filter sediment, keeping surface waters and aquifers cleaner and reducing treatment cost to cities. Mature, native forests provide these benefits more reliably than plantations, so preventing deforestation in watersheds is critical. Water scarcity caused by drought, groundwater depletion or reduced river flows affects many cities around the world — especially in arid regions. Preventing deforestation and restoring forests can increase soil infiltration and groundwater recharge. Forests also modulate rainfall patterns at regional and even global levels. Forest evapo-transpiration acts like a giant pump, sending water into the atmosphere and redistributing it before it falls as rain. How NGOs contibutes to urban forest projects Non-Governmental Organizations, commonly referred to as NGOs, have emerged as key players in the realm of sustainable development, wielding a potent blend of advocacy, community engagement, and resource mobilization to drive impactful change. These organizations, often fueled by a passion for environmental conservation and social equity, operate at the forefront of global and local sustainability efforts, transcending geographical boundaries and political constraints.

NGOs undertake diverse roles in the context of sustainable urban tree planting, ranging from facilitating community-based reforestation projects to advocating for policy reforms that support sustainable land management. Their efforts encompass a wide spectrum of activities, including awareness campaigns, capacity building, and fostering partnerships with governmental bodies, private enterprises, and local communities. Examples of such NGOs in Ghana include; Plant-for-the-Planet Ghana is an independent, non-profit and non-governmental organization operating in Ghana. It advocates for and empowers young people to fight the climate crisis and restore degraded ecosystems in the Northern Savannah Ecological Zone in Ghana. The Environmental NGOs Tropenbos Ghana and EcoCare Ghana, partners implementing the European Union funded Landscapes and Environmental Agility across the Nation (LEAN) project in the transition landscape donates about thirty nine thousand (39,000) indigenous and fruit tree seedlings to the Bono East Regional office of Forestry Commission in Ghana in support of the government's Green Ghana Project. The Green Ghana Project is an initiative by the Ministry of Lands and Natural Resources, which seeks to plant and nurture to maturity five million trees in a day to restore the country's degraded landscape and forest cover. Earth Care Ghana is a non-governmental organization (NGO) based in Ghana that focuses on environmental sustainability, climate change, and natural resource management with the aim of promoting sustainable development through community engagement, education, and advocacy. Earth Care Ghana's work is focused on several key areas, including; Climate Change Adaptation and Mitigation. Earth Care Ghana works with communities to develop and implement strategies to adapt to the impacts of climate change, as well as reduce greenhouse gas emissions. Sustainable Agriculture: The organization promotes sustainable agricultural practices that enhance food security, reduce poverty, and promote sustainable land use. They also work to conserve Ghana's unique biodiversity by promoting sustainable natural resource management and protecting threatened species and habitats.

Global Climate actions and regenerative policies on Urban Forests

In the words of the former Secretary-General of the United Nations, Ban Ki-moon, 'climate change carries no passport and knows no national borders. Countries must work toward the common interest, beyond narrow national interests'. (UN News Centre 2015).

Climate change indeed does not need a passport to enter any country in the world. The phenomena could spring up on both developed or developing countries. Its adverse effects also knows no boundary. Therefore, the United Nations, private organisations, local and world governments are striving hard to save the planet through the implementation of joint urban forest projects as a means to mitigate climate change. Melbourne's Urban Forest Strategy In Melbourne, Australia, the millenium drought, higher temperatures and ageing urban tree population threatened the city with an environmental challenge. And as such, an important response from the city was the creation of the 'Urban Forest Strategy' which promised and delivered thousands of newly planted trees in 2012. This tree growing canopy continue to help residents of Melbourne survive the intense heat of summer. The strategies and targets proposed to achieve this vision was to increase canopy cover, increase urban forest diversity (The urban forest will be composed of no more than 5% of any tree species, no more than 10% of any genus and no more than 20% of any one family, Improve vegetation health, Improve soil moisture and water quality, improve urban ecology among others.(CPI 2016)

Trees for Life: Barcelona Tree Master Plan 2017-2037

Barcelona (Spain) is currently implementing the "Trees for Living - Barcelona Tree Master Plan 2017-37" as part of its Green Infrastructure and Biodiversity Plan until 2020. The plan embodies the city's vision of trees as a fundamental part of Barcelona's green infrastructure and aims to increase the city's tree cover by 5%, so that 30% of the city's surface area is covered with trees. Specifically, the Tree Master Plan is the strategic document that guides the Barcelona City Council for future planning, management and conservation actions for municipal trees in the urban area. As such, the plan aims to combat the adverse effects of climate change on urban development and, at the same time, increase urban biodiversity, connect people with nature and provide ecosystem services. (Aujtament de Barcelona 2017).

Trees in Cities challenge In 2019, the United Nations Economic Commission for Europe (UNECE) launched the "Trees in Cities Challenge" at the Secretary-General's Climate Action Summit (New York, 21 September 2019), aiming to raise the awareness of policy-makers of the potential of urban trees and forests as a nature-based solution to climate change. The initiative invites mayors and urban authorities to make a scalable pledge to expand their urban canopy cover within a year, and in that way give a local contribution to climate action and help achieve the Sustainable Development Goals.(UNECE 2019) UNECE Petit Forest Network The UN Petite Forest Network is a global initiative aimed at creating small urban forests that revitalize communities, enhance biodiversity, and mitigate climate change. By working with cities and organizations around the world, the Network promotes the establishment of petite forests as a vital part of sustainable urban development. (UNECE 2024).

Hanwha Solar Forest

Initiated ten years ago, the Hanwha Solar Forest progra was cited at a general meeting of the United Nations Convention to Combat Desertification in 2011 as the world's first corporate project using solar energy to fight desertification. This initiative is different from its peers because it uses solar energy to power its nurseries. Solar energy supports the clean water supply, temperature and humidity control, and lighting conditions required to nurture saplings, creating a carbon-neutral forest. Since the program's launch in 2011, it has created eight forests throughout South Korea, China, and Mongolia and led to the planting of half a million trees in 1.33 million square meters, equivalent to 180 soccer fields.(Hanwha 2022) Green Ghana Project Lunched in 2011, the Green Ghana Project, a reforestation program, funded by the European Union is a national initiative to restore Ghana's forests and combat climate change. The projects goals is to plant millions of trees, improve livelihoods of rural communities, beautify the environment, preserve biodiversity, mitigate the threat of bush-fires and promote the cultivation and protection of shea trees. Conclusions.

Forests are crucial in the fight against climate change, and protecting them is an important climate solution. Cutting down forests on an industrial scale destroys giant trees which could be sucking up huge amounts of carbon. And with the looming threat of rapid climate change, the future of forests remains uncertain. Given these challenges, along with the multitude of socio-environmental benefits forests offer and the urgent need for immediate and decisive climate change mitigation actions, afforestation and reforestation programs are gaining steadily increasing attention.

Ironically, the work of urban tree planting-including watering, seasonal climate control and general maintenance can rely on fossil fuel. To reach their full potential, it is important therefore that afforestation and urban forest initiatives use green energy. The private sector, government and the public must design green initiatives to become net-zero, transitioning from fossil fuel to use green energy sources.

Overall, effective climate change mitigation demands a comprehensive strategy for both restoring degraded urban forests and establishing new ones, alongside sustained and intensified endeavors to reduce anthropogenic greenhouse gas emissions.

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Climate Change and Human Migration in Zimbabwe – Reporting Underserved Issues Using Story Telling Techniques

Abstract:

Climate change is one of the greatest human threats today. Both humanity and biodiversity face extinction if countries do not address pressing issues, align themselves to the Paris agreement, put in place mitigating and adapting measures to save earth. Countries in the Global South are the most affected, this has resulted in migration. With millions of people in the Global South residing in rural areas and surviving on rain fed communal agriculture, they have been severely affected1. Low rainfall and high temperatures reached a record high in 20232 in the history of mankind.

The year 2024 carried over the effects, this has greatly impacted agriculture. Without production, food security is threatened, people are migrating into urban areas, while other relocating to other countries. According to 2022 national census4, most of the cities have ballooned in their number, suffocating the cities. Zimbabwe has introduced conservation agriculture5, a concept known as Pfumvudza/Intwasa to cushion farmers and mitigate against climate change. The concept is laborious and without enough rains, it cannot mitigate the persistent effects of climate change. Climate change induced migration has been underreported in Zimbabwe. This paper acknowledges the emerging trend of migration and the available of tools and techniques to report on climate change and its effects.

Keywords:

Climate Change, migration, agriculture, rural areas, Zimbabwe

Introduction

Migration has existed for the longest time and is as old as history itself. The International Organisation of Migration (IOM) defines migration as the movement of a person away from his/her place of usual residence, whether within a country or across an international border, temporarily or permanently, and for a variety of reasons. Many factors have been cited over the decades as the causes of migration. But, of late, climate change is one of the causes in Zimbabwe, however, this has been underreported. Climate change is becoming the fastest driver of migration, beyond Zimbabwe but across the global South. The findings by C40 Cities show6 that up to 8 million people are likely to move to the ten cities identified in the report by 2050 as a result of the climate crisis alone, exacerbating existing trends of migration towards cities. This raises some of the questions this paper endeavor to answer.

These questions are:

1. Is climate change a driver of climate change?
2. Why reporting on climate change has underreported this subject?
3. In which ways can journalist best report climate change have induced migration in Zimbabwe?

The year 2024 has seen a surge in the reporting on climate change. The interest has been seen in many countries who had or still have elections. The reporting focused on the governments commitments internationally and locally. Although the difficulties in addressing climate change remain unchanged, experts and campaigners agree that 2024 is the year to establish the next standards for climate disclosure and action. There is an extraordinary global movement to move past the era of fossil fuels.

Last year, climate science experts predicted that by 2024, trends in the world's climate should raise serious concerns as well as cautious hope. This year is even hotter than 2023, which was by far the hottest year ever recorded. For the first time, the yearly average global temperature might rise above 1.5°C above pre-industrial levels, a critical point for achieving climate stabilization.

As El Niño conditions developed in the Pacific Ocean, it contributed to the unprecedented rise in global temperatures. The Copernicus Climate Change Service of the European Union discovered that 2023 was 1.48°C warmer than the pre-industrial normal. Extreme occurrences and global disasters were brought about by warmer global temperatures in 2023.

According to the United Nations, the climate catastrophe has destroyed important natural ecosystems and resulted in over 2 million deaths and $4.3 trillion in economic damages over the previous 50 years. It will only intensify further and affect people's ability to obtain food and water, two of the most important human resources. In Zimbabwe, this has resulted in migration from rural to urban and from both rural and urban to neighbouring countries and overseas. People are looking for paid jobs leaving their fields, a source of livelihood for the past centuries.

1. Climate Change as a Driver of Climate Change

Climate Change, according to the United Nations, refers to the long-term shifts in temperatures and weather patterns. In a study on Climate Change and Global Temperature, Lindsey & Dahlman (2024) says the Earth's temperature

has risen by an average of 0.11° Fahrenheit (0.06° Celsius) per decade since 1850, or about 2° F in total. They say 2023 was the warmest year since global records began in 1850 by a wide margin. It was 2.43 °F (1.35 °C) above the pre-industrial average (1850-1900). Most countries in the Sub –Saharan region, Zimbabwe included are affected by climate change despite them not being major emitters of greenhouse gases. According to the World Bank Zimbabwe CO2 emissions per capita in 2020 were 0.53 metric tons. The effects have been evident in Zimbabwe in the past decade resulting in both the government and people taking actions to mitigate the effects. But not all, some are taking the great trek to neighbouring countries.

Despite mitigation, adaptation is cited as one of the options to local communities in response to climate change. But, to communities in Matabeleland South – South West of Zimbabwe, the majority of villagers are migrating to neighbouring Republic of South Africa and Botswana in search of greener pastures and job opportunities.

Using Matabeleland South as a case study in this essay, most of the communities rely in livestock farming hence the need for more rains for the pastures and moderate temperatures to sustain the environment. According to Lindsey & Dahlman (2024) findings, the 10 warmest years in the historical record have all occurred in the past decade (2014-2023). These changes un weather overtime have affected communal livestock in the region.

Against the backdrop of notable movement trends, the International Organization for Migration (IOM) reports that the Matabeleland South Province topped the list of potential migrants seeking employment in South Africa. throughout all, 54,960 movements were registered and 3,379 migrants were interviewed at 38 Flow Monitoring Points (FMPs) throughout Zimbabwe during the reporting period.

Zimbabwe with a GDP of 27.37 billion USD (2022) according to the World Bank. The country is experiencing high inflation and loss of confidence in local currency. The economic downturn is attributed to the closure of industries at the turn of the millennium which rendered the majority of the people jobless. Unemployment in Matabeleland South is high and agriculture especially livestock farming gave a promising future. Without enough rains for both the livestock and pastures, farmers cite incapacitation which even affects them in replenishing the stock resulting in losses.

Some school of thought argue that Zimbabwe's agriculture performed better under the white settlers who were sent parking enmasse in the early 2000s and the current situation is as a result of of poor governance. I disagree with that point citing that, despite Zimbabwe's political and economic challenges, the latest reduced harvests are as a result of climate change nit government challenges. In 2000 when whites' farms were repossessed, the world had 5 years since stated its first cop, a realisation that despite race, politics, economic status the globe was under threat. And 15 years later Paris Agreement was put in place to monitor emissions and 195 countries made commitments.

The low rains received during during the 2023/24 agricultural season even affected the plough power of the farmers. In communal areas in the province small scale farmers use cattle and donkeys for plough power which needs to be in good health. This has been also affected. Climate induced migration has seen the majority of people heading 'south' as they cannot rely on agriculture anymore for survival. Some high school students are even dropping out of school to find opportunities in the nearby diaspora.

According to the Zimbabwe: El Niño Anticipatory Action Plan, Oct 2023 - Mar 2024 prepared by UNOCHA, over time, Zimbabwe has struggled with the effects of the climate crisis, which have resulted in unpredictable rainfall patterns that are either marked by major floods or protracted droughts. There has been a worrying national trend in the number of regions reporting rainfall levels.

The El Niño phase was predicted to be felt most strongly in the southern, west to east sections of the country, according to the Meteorological Services Department (MSD) last year. These include Matabeleland South, which also had significant levels of food insecurity during the El Niño phase of 2015–16. Livestock farming is gradually becoming a business for those who are well-off as they can afford to drill boreholes for water supply and buy livestock feed from suppliers. However, the majority of the people in the villagers cannot afford that and are forced to quit farming, migrate and start afresh, at least survive and their families.

The migration is by both men and women. Those migrated are showing a change in lifestyle and proving that their decision to migrate was at least 'right'. Most of the rural villages in the region have been transformed from ordinary mud and thatch houses to picture square infrastructure that is changing the history of these communities. Despite infrastructure
development, many initiatives have been initiated on giving back to the community, like building schools and clinics, achievements they could not have done while in Zimbabwe.

However, it must be noted that the migration is coming at a cost to the affected communities. In most households' women are left behind taking care of children while men find opportunities. This has affected marriages as cases of infidelity are on the rise and consequently murder incidents when the men found out the infidelity. Also men in the diaspora are ending up co-habiting with other women, resulting in sexual transmitted infections and diseases which are then spread in a vicious circle.

In the same vein, most of the affected communities are now populated by the elderly, women and children posing both security and economic risks to the affected groups as they cannot be actively involved in community development and economic endeavours. The absence of young people has a political effect in decision making processes such as elections, governance and accountability which needs active voices.

Lack of these voices to actively remind policy makers in prioritising climate change which make things remain the same. Local political analysts say instead of migrating enmasse there is a window opportunity that young people and other active members of the society migrating can change the situation through policy advocacy, demand for the Green Climate Fund and other climate solutions which can make their communities habitable as they adapt to climate change.

To tackle climate change and its negative impacts, world leaders at the UN Climate Change Conference (COP21) in Paris reached a breakthrough on 12 December 2015: the historic Paris Agreement. The Agreement lays out long-term objectives to direct all countries. In order to significantly reduce the risks and impacts of climate change, the goals include reducing global greenhouse gas emissions to well below 2°C above pre-industrial levels and pursuing efforts to limit it to 1.5°C above pre-industrial levels. Additionally, there will be periodic assessments of the collective progress made towards fulfilling

the agreement's long-term objectives. The most crucial thing is to provide developing nations the money they need to reduce climate change, build resilience, and improve their capacity to adapt to its effects. Some claim that the agreement's enforcement clause is not affective, and there is no proper monitoring tool for the member states on compliance or target threshold.

2. The Connection of Socio-economic factors with climate change in migration

The International Organization on Migration (IOM) claims that the relationship between migration and the environment is not new and that one of the main causes of migration has always been the environment. But climate change makes it far more relevant now and in the future. The Intergovernmental Panel on Climate Change (IPCC) suggested that "the gravest effects of climate change may be those on human migration" in its First Assessment Report (1990).

From the video lessons, the frequency and severity of extreme weather events, such as heat waves, floods, and tropical storms, as well as the slow processes of environmental deterioration, have increased during the last ten years due to climate change. Human mobility is being significantly impacted by climate change, which is also having negative effects on livelihoods, public health, food security, and water availability. As a result, its scope is probably going to increase significantly.

According to future projections from the Intergovernmental Panel on Climate Change (IPCC), global temperatures are expected to rise by an average of 1.5°C over pre-industrial levels between 2030 and 2052 if current trends continue.

Since the environment, particularly the effects of climate change, is typically one of several factors that influence a decision to relocate, it is typically challenging to demonstrate a clear and straightforward causal relationship between human mobility and the environment. The decision to move and the type of migration are influenced by a number of other factors, including demographic trends, gender, livelihood strategies, conflict, human and economic development levels, and the availability of alternatives to migration.
A similar argument was made in a 2011 UK Government Office for Science report on the subject, which stated that "it is problematic to assign a proportion of the actual or predicted number of migrants as moving as a direct result of environmental change" because migration is a multi-causal event.

The UN's refugee agency, UNHCR, does, however, estimate the annual number of individuals who are "forcibly displaced" due to "weather-related sudden-onset hazards." This was expected to reach 31.8 million people in 2022. Floods (19.2 million), storms (10.0 million), and droughts (2.2 million) were the main causes of these displacements, with the remaining number coming from landslides, wildfires, and extremely high temperatures. Every year, this number varies greatly. For instance, it varied between 13.9 and 38.3 million between 2008 and 2021. Nonetheless, most scholars and experts agree that the frequency and severity of the extreme weather events that result in forced relocation are rising due to climate change.

The majority of environmental migration is probably internal. Droughts brought on by climate change have caused a large-scale migration from rural to urban areas in Zimbabwe.

Mass displacement was a subtext in the climate negotiations that resulted in the 2016 Paris Agreement, and climate change has been cited by analysts as a primary cause of migration from sub-Saharan Africa to Europe and as a contributing factor in some recent migrations from Central America to the United States. There is strong historical evidence that population movements have been significantly influenced by climate considerations.

International, long-distance migration rates may decline as a result of environmental degradation, according to certain studies. This is because long-distance migration is comparatively expensive. When such migration does occur, it often follows established migratory paths. While a variety of socioeconomic factors also play a significant influence, distinct environmental events and processes tend to produce diverse forms of mobility.

The House of Lords in the UK Parliament stated that over the next few decades, migratory flows are expected to rise due to climate change. It is anticipated that more "forcible displacements" will result from more frequent and severe extreme weather events, and that the "slow-onset" effects of climate change will render the most affected areas uninhabitable. In order to discuss and work together on these challenges, the UK participates in a number of international forums. In the last five years, the majority of South East Asians and Africans who live in fragile regions with weak economies have been moving to west Europe.

According to the IOM 2022 "World migration report," slow-onset environmental processes and catastrophes are putting ecosystems in greater jeopardy. For example, sea level rise and saltwater intrusion may endanger freshwater resources, while heat waves may result in the loss of agricultural land and a decline in production. Slow-onset processes that deplete ecosystem services could have a direct or indirect effect on human security, such as when disputes arise over limited natural resources or when food and water become scarcer. Human security threats may therefore lead people to migrate in quest of alternate sources of income and means of subsistence.

With 86 million expected to be displaced in Sub-Saharan Africa alone, the World Bank's 2021 scenario-based analysis projected that "as many as 216 million people could move within their own countries due to slow-onset climate change impacts by 2050." More importantly, it indicates that in a more "climate-friendly" scenario with drastically lower greenhouse gas emissions, its headline estimate may be lowered by as much as 80%. "Policy makers will need to enable mobility by creating supportive environments for planned and orderly migration into areas of low risk and high opportunity," the report noted, adding that even in this scenario, tens of millions of people would still need to relocate away from unavoidable climate risks.

The IPCC states that although there is growing research in developed nations, the majority of the study on climate migration has taken place in poor nations. Because of their heavily urbanized populations and extensive, global supply chains, which make people's earnings and lives less reliant on local environmental circumstances, developed nations have received less attention.

3. Integration of Social Equality into regenerative economic strategies in the face of climate change induced migration

Communities around the world are suffering from the effects of climate change. Droughts, challenges to biodiversity, and the financial burden of climate

change notwithstanding. Scientists assert that economies may embrace regenerative tools and strategies to maintain the environment.

Lovins, etal (2007) states that, whole systems thinking is used in regenerative design to build just and resilient systems that balance the preservation of natural resources with societal demands. As the catastrophic effects of climate change become increasingly obvious on a daily basis, it is obvious that decisive action must be taken worldwide to save the environment. Regenerative design provides a potent remedy by designing environments that actively promote environmental healing while also causing less harm. We can build a better future for ourselves and future generations by embracing regenerative design frameworks, mind-sets, skills, and technologies.

The goal of regenerative design as a methodology, is explained by Bregman, R., (2021) as to rebuild, regenerate, and repair our natural and human-made ecosystems and communities. He posits that, regenerative design is something that everyone who cares about how humans affect the environment and its resources should be aware of. Public policy, industry development, building design and construction, agriculture, food systems, production and consumption of consumable goods, waste management, energy and water management, and the list goes on. All of these projects can benefit from the use of this methodology.

The environment is interwoven with the global economy. Corporations' balance statements do not reflect the value of ecological services. However, that startling omission has drawn a lot of attention recently. By putting them through a rigorous review process, natural capital solutions (NSC) frameworks identify the best ways to conserve nature and its resources and offer an evidence-based rationale for funding conservation efforts.

Through acknowledging and integrating the significance of ecosystem services into the process of making decisions, NCS frameworks facilitate the creation of long-term economic advantages for businesses and communities alike, while also promoting sustainable land, sea, air, and water usage and increased biodiversity. All things considered, using NCS frameworks is a crucial tool for people who want to guarantee that the advantages of nature will be available to future generations. Experts say that, such frameworks must be in place in Zimbabwe to assist communities faced with climate change induced migration.

Conversely, social equity refers to the equitable and right allocation of resources, opportunities, and advantages within a community. Government assisted programs to cushion communities from climate change induced drought has been of concern in Zimbabwe. Partisan distribution7 of supplements and aid has been flagged, making the situation worse and people ultimately migrating to other places. An increasing number of people are worried about social fairness in sustainability initiatives in the last few years.

According to Fath, B, etal (2019), regenerative systems are becoming more and more necessary in order to support social well-being as well as environmental and economic sustainability. The majority of businesses contribute to the development and upkeep of disparities through their employing practices, supplier chains, and clientele that they either serve or do not serve.

Thus, models that highlight existing social justice inequalities are essential to regenerative systems. Several different solution models can be used to accomplish social justice and revitalize our systems. Zheng, Lily (2020) men-

tions that, frameworks for corporate social justice are intended to address environmental and social challenges that are frequently disregarded by conventional business methods.

The goal of corporate social justice frameworks is to advance justice, equity, and fairness in all facets of a business' operations. They can include a broad range of activities, such as co-designing food and service lines with underrepresented groups, diversity and inclusion initiatives, community outreach, and ethical sourcing. By implementing these principles, businesses may contribute to the creation of a more equitable and sustainable society, which will enhance their reputation and generate new brand value.

Participatory budgeting is a different approach that is said to advance social justice and develop more regenerative systems. Bregman (2021) does a good job of discussing this in Humankind: A Hopeful History. He says, social equity solutions can be achieved, in general, by encouraging the involvement of marginalized populations in the decision-making processes of policy formulation, business model reform, and the creation of socially just supply chains.

A wide range of significant social and environmental concerns face Africa's development in this era of fast economic growth and global climate change. The UN 2030 Agenda for Sustainable Development, which is a "plan of action for people, planet, and prosperity," and the African Union's Agenda 2063, which aims to create "a prosperous Africa based on inclusive growth and sustainable development," are two platforms through which aspirations for sustainable development in Africa have been realized (United Nations, Citation 2015). However, it is rarely discussed specifically how the continent will grow economically while reducing social and environmental problems.

For Zimbabwe, addressing the continent's major social and environmental concerns is an actual concern. There will be a growing workforce and economy due to the predicted population explosion and mass urbanization, which will also increase demand for energy, food, water, and infrastructure. A warming planet that is accelerating the loss of biodiversity is accompanied by increased pollution, negative effects on health and wellbeing, and human migration due to climate change and other factors that affect Africans. Zimbabwe has an abundance of natural resources, both renewable and non-renewable, which is important for the world's transition to sustainability. Kieh (2000) says, however, too often, non-Africans gain from these resources. burdened by colonialism's past.

4. Using interactive maps to visualize the impact of climate change induced migration

Maps can be used to convey the geographic context of environmental issues, show spatial patterns and trends, and illustrate complex data. We learned a lot about the value of mapping in climate change reporting via the didactic platform's video tutorials. Maps are effective tools for environmental journalists who wish to present captivating tales about the condition of the earth and its resources, claims the Internews – Earth Journalism Network8.

A complicated subject, climate change was initially referred to as "global warming." Because of that word, people began to confuse weather, which is a shorter-term expression of broader climate trends, with climate change. Compared to seasons, climate trends are longer-term and might be more difficult to interpret intuitively since individual weather occurrences can distort

perceptions of the trend. This is where data visualization can help journalists go beyond their own experiences with the weather and instead concentrate on long-term patterns and trends that exist on a scale that would otherwise be difficult for the audiences to notice. Examining the historical evolution of geographical areas that would otherwise be stable serves as a useful proxy for understanding climate change.

Authorities and organizations must first identify the problems that need to be handled, where they are, and, if feasible, how serious they are in order to prioritize and design appropriate solutions.
Fortunately, making the most of geographical data is not all that different from how mapping is done nowadays. According to the video lessons during the course of the program, maps are widely used to illustrate trends; examples are Covid-19 hotspots, differences in home values, and even graphic maps that blend aerial images with text to highlight the consequences of urbanization.

The didactic video presentation states that, the effects of climate change can be tracked, managed, and eventually measured using geospatial data. One such tool is geographic data. It has been applied to monitor continuing changes as well as the consequences of climate change. Additionally, it can pinpoint particular regions that need maintenance, such parks, areas with a higher risk of pollution, or places where the temperature fluctuates.

Maps are undoubtedly helpful, but not all maps are made equal, and selecting the appropriate kind of map for the narrative can have a significant impact on how the audience interprets and interacts with the reporting. Only two map types were discussed in the video lessons, but they represent a variety of map kinds that may be made and provide guidance on which sort of map to use for different situations.

Although there are many different kinds of maps that can be used, these are some of the more popular ones for environmental and climate journalism. The most basic maps, known as base maps, depict the fundamental geographic elements of a region, including its borders, cities, rivers, and highways. They can serve as a stand-alone map to show position and orientation, or they can be used as a background layer for other kinds of maps. Choropleth maps are those that illustrate how a variable (such pollution, income, or population) vary over several geographic areas (like states, districts, or countries) using a variety of hues or shades. They can be used to illustrate spatial patterns and trends or to compare and contrast various places.

Dot maps are maps in which individual data points or events are represented on the map by dots or other symbols. They might be used to draw attention to particular areas or cases, or they can be used to illustrate the density or dispersion of a phenomenon (such as illness outbreaks, crime episodes, or sightings of wildlife). Heat maps, bubble maps, flow maps, satellite maps, and interactive maps are some other kinds of maps.

When utilizing maps, a journalist's decision regarding which type of map to use for an environment or climate story depends on a number of aspects, such as the story's nature, the data at hand, and the key points they want to convey to the reader. The map's constant purpose is to aid in the audience's better understanding of the narrative. A map will be not doing its job if it misleads or confuses the viewer. Complex data should be shown on the map in an understandable and straightforward way. It ought to offer precise, pertinent, and easily understood information. To improve the readability of the data, colour, scale, and other visual cues should be taken into account.

The necessary tools must be used in order to accomplish the goals in order to effectively utilize maps to show the effects of climate change. The tutor at UNINETTUNO brought up Drawrapper during the lesson. It is a popular tool in journalism for making interactive, mobile-friendly maps and other data visualizations that can be included into online publications. Other online mapping tools include Flourish, Mapbox, ArcGIS, Tableau Public, QGIS, Leaflet, Google Earth, and Google Maps.

The necessities of our global landscape have led to the development of increasingly sophisticated methods for data visualization on maps. Exploring map data has been easier thanks to the Tableau-Mapbox interface, which has produced some interesting images. For example, one visualization shows how the world might look in 50 years if climate change is not addressed.
According to National Geographic9, maps show multiple indicators of climate change layered on top of one other. The information gathered globally by scientists, investigators, explorers, and local residents keeps us informed about Earth's warming process. By superimposing different climate change indicators on top of each other and displaying the data on a global map, viewers are able to see a more complete picture of how Earth's climate is changing.

5. Data visualization helps us see the effects of climate change in Zimbabwe

During the Earth Day, UNHCR, the UN Refugee Agency, released a new data visualization 'Displaced on the frontlines of climate change' that shows how the climate emergency is converging with other threats to drive new displacement and increase the vulnerability of those already forced to flee. The data visualization explores how disasters linked to climate change may worsen poverty, food insecurity and access to natural resources in ways that can stoke instability and violence. Such a tool is helpful for journalists in Zimbabwe to tell stories and understand migration and other effects related to climate change. impacts of our changing climate are being felt worldwide, but countries already struggling with conflict, poverty and high levels of displacement are dealing with some of the most severe effects. From Afghanistan to Central America, droughts, flooding, and other extreme weather events are hitting those least equipped to recover and adapt.

In order to address climate change and lessen its effects on the lives and livelihoods of hundreds of millions of people worldwide, the agency is urging States to act quickly and together. Additionally, it is calling on states to increase the protection and aid they provide to those who have been displaced by natural disasters and the consequences of climate change.

"We need to invest now in preparedness to mitigate future protection needs and prevent further climate caused displacement," stated UN High Commissioner for Refugees Filippo Grandi earlier this year. One cannot afford to wait for calamity to occur.

Nocke et al. (2008) state that one of the most important technologies for evaluating and displaying climate observations and simulations, along with associated social and ecological data, is visualization. Additionally, it is becoming more and more crucial to communicate research findings in an accessible manner to decision-makers and the broader public.

Climate modellers produce ever-larger simulation data sets as processing capacity increases. The expansion of climate-related data is facilitated by im-

proved observation methods like satellite operations. NOCKE et al. (2008), posits that, journalists can learn these strategies to help simplify the material and give the data a human face. Analysis is becoming the bottleneck when attempting to uncover the underlying qualities in the data, such as patterns and statistical links between the variables.

By making abstract data more approachable and interesting, data visualization can be used to assist people understand the implications of climate change. Communicating difficult information will be made easier with this. For instance, one graph would depict the consistent rise in food insecurity, and another might depict the rise in migration. The presentations for the video lessons demonstrated how visualizations may raise public awareness of problems like climate change. A map that depicts the causes and effects of climate change, for instance, can aid in educating the general population. On a more optimistic note, during times of migration, visualizations can assist communities in comprehending climate change and creating adaptation plans.

Conclusion

The essay shows that climate change is a global emergency that goes beyond national borders. It is an issue that requires international cooperation and coordinated solutions at all levels. In most affected communities globally there is migration as people find better places and pursue other economic opportunities away from farming. Throughout the past century, changes in global climate patterns have led to an increase in extreme weather events such as heat waves, droughts, and storms. Depending on the geographical circumstances and the ability of the nations and communities in question to adapt, the effects of climate change will vary. The migratory effects of climate change will also be most severe for nations with low adaptation capacities, notably sensitive geographic areas, and delicate ecosystems. Africa is going through a period of tremendous population increase, migration, and economic expansion at the same time that the continent's biodiversity is declining and the climate is warming. Collectively, these signify significant socioeconomic and environmental issues. Both the UN and the African Union support sustainable development, which sees social growth with environmental preservation.

The essay showed that besides the opportunities, climate induced migration is coming at a cost of dissolving the social fabric and weakening the 'source' communities especially in Zimbabwe. Issues raised calls for the journalists to fully report this trend using engaging story telling techniques such as maps and data visualisation. The essay identified three action levers that are visible in Africa and support the concept of a regenerative economy: using African values of horizontal collectivism, leapfrogging through decentralized communication and energy infrastructure, and clean innovation in technology and business models.

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Country
Algeria

What is your government's approach to risk management in renewal economic projects?

Abstract:

The Algerian government focuses on risk management in renewable economic projects by strengthening the legislative framework to achieve economic diversification and reduce reliance on oil. Algeria is actively working to attract both local and international investments and advance sustainable energy technologies.

These measures include the promotion of solar and wind energy, which are essential components of the country's drive toward a sustainable economy. By prioritizing environmental sustainability also Algeria aims to foster innovation and create a more resilient economy that aligns with global climate goal.

Keywords:

Risk Management, Renewable Economic, Economic Diversification, Sustainable Energy, Sustainable Economy, Environmental Sustainability Management Desalination Soil Degradation Irrigation Technologies Heat Stress

Introduction

Risk management plays a key role in the success and sustainability of renewal economic projects. Strategies to eliminate these hazards depend heavily on governments functioning in ways that create an environment conducive to economic growth. Four common governance strategies for managing risks in renewal economic projects are identified and described, based on examples from several countries and regions, revealing the importance of such approaches in supporting economic stability and resilience. By detailing certain case studies and considering existing literature on risk management and the success of economic renewal programs, we can better understand how effective risk management can be achieved.

Effective risk management in renewal economic projects remains a significant challenge for governments worldwide. Renewal economic projects, aimed at revitalizing and sustaining economic growth through innovative policies and investments, are often fraught with various risks.

These risks range from financial uncertainties and technological advancements to political instability and environmental concerns (Smith, 2020). Proper risk management is essential to mitigate these risks and ensure the successful implementation of these projects. This research focuses on exploring the strategies and approaches adopted by governments to manage risks in renewal economic projects, particularly in the context of developing economies (Johnson, 2018).

Over the past decades, numerous studies have examined the importance of risk management in economic development projects. The existing literature highlights the necessity of a robust theoretical framework that integrates economic theories, risk assessment models, and policy analysis to address the complexities involved in renewal economic projects (Brown, 2019). The theoretical framework for this research builds on established economic theories of risk management, including the Modern Portfolio Theory and the Risk-Adjusted Discount Rate Method. These theories provide a structured approach to evaluating and mitigating risks associated with economic projects (Garcia-Bernabeu, Mayor-Vitoria, Bravo, & Pla-Santamaria, 2019).

This research posits that a comprehensive and adaptive risk management strategy is crucial for the success of renewal economic projects. It argues that governments must not only identify and assess potential risks but also implement proactive measures to mitigate these risks. Furthermore, the study contends that collaboration between public and private sectors, along with international partnerships, can enhance the effectiveness of risk management strategies (UN DESA, 2024).

By integrating theoretical insights with practical case studies, this research aims to provide a nuanced understanding of how governments can effectively manage risks in renewal economic projects.

This research fits into the existing body of work by building on the theoretical frameworks of risk management and applying them to the context of renewal economic projects. It seeks to bridge the gap between theory and practice by analyzing real-world examples and identifying best practices for risk management. In doing so, it contributes to the ongoing discourse on economic development and offers actionable insights for policymakers and practitioners involved in renewal economic projects (Gatzert & Kosub, 2015). In recent years, sustainable development has become a key focus of Algeria's economic

projects. This approach aims to balance economic growth, environmental protection, and social justice. Algeria's green economy is a crucial tool for achieving sustainable development and is seen as a strategic priority. Recent economic projects reflect this focus, although they come with certain risks.

This article discusses Algeria's approach to risk management in these green economic projects, highlighting significant achievements and initiatives. It emphasizes the importance of the green economy in achieving sustainable development. Project risk management involves a structured method to identify, regulate, and respond to risk factors, helping to prevent project failures. The green economy, a model for rapid economic development, aligns with sustainable development goals, environmental conservation, resource optimization, and socio-economic prosperity. It seeks to preserve the environment, promote economic activity, ensure social justice, and mitigate environmental risks. Algeria's adoption of the green economy is evident in various practical applications and initiatives.

1. What are the risks?

Effective project management requires a thorough understanding of various risks that can impact project success. Below are key categories of risks:

1.1 Financial Risks: Financial risks involve issues that can affect the budget and overall financial health of a project.

- Budget Overruns: These occur when actual costs exceed initial estimates. Reports indicate that about 70% of construction projects experience cost overruns, often due to inaccurate cost estimations or unexpected expenses (Flyvbjerg et al., 2003).
- Cash Flow Management: Poor cash flow can halt project progress even if the overall budget is intact. This is particularly critical in construction, where significant upfront investments are common (Brealey et al., 2011).

1.2 Technological Risks: These risks arise from challenges associated with adopting or integrating new technologies.

- Integration Issues: New technologies may not seamlessly integrate with existing systems, leading to delays and increased costs (Morris & Pinto, 2010).
- Adoption Challenges: Resistance from team members or insufficient training can hinder the effective use of new tools (Davis, 1989).

1.3 Political Risks: Political risks refer to uncertainties stemming from changes in government policy or political instability.

- Policy Changes: New regulations or shifts in government priorities can impact project viability and funding (Bennett & Iossa, 2006).
- Public Opposition: Projects may face backlash from communities, leading to delays or additional costs (Fischer, 2000).

1.4 Environmental Risks :Environmental risks encompass unforeseen impacts on the environment, regulatory challenges, or natural disasters.

- Regulatory Challenges: Changes in environmental regulations can impose additional requirements on projects, increasing costs and timelines (Porter & van der Linde, 1995).

- Natural Disasters: Events like floods or earthquakes can disrupt project schedules and increase expenses significantly (Cutter et al., 2008).

2. How does Algeria's Risk Management Strategies for Green Economic Projects?

- Legal and Regulatory Framework: Algeria seeks to strengthen its legal and regulatory framework for managing economic projects. This includes updating investment-related laws, licensing procedures, and reviewing customs and trade regulations to facilitate the business environment and reduce legal risks (Garcia-Bernabeu et al., 2019).
- Infrastructure Development: Significant investments in infrastructure development, such as ports, roads, and energy, help reduce logistics and transport risks and increase the effectiveness of economic projects (Brown, 2019).
- Strategic Planning and Risk Assessment: The Algerian National Strategy for Sustainable Development outlines goals and measures for sustainable development, including risk management practices for projects aimed at environmental and economic regeneration. It involves comprehensive planning to anticipate and mitigate potential risks (Johnson, 2018).
- Stakeholder Engagement: Local community involvement in solar projects, such as the Noor Solar Complex, helps manage social and environmental risks through consultations with local stakeholders to address concerns and adapt plans accordingly (Smith, 2020).
- Monitoring and Evaluation: Environmental Impact Assessments (EIAs) are conducted for large-scale projects, such as developing renewable energy plants or water management systems, to assess potential environmental risks (UN DESA, 2024).
- Financial Oversight: The Algerian government encourages green investments and provides financial incentives for projects that meet sustainability criteria. This includes financial risk management practices to ensure projects are economically viable and sustainable (World Bank, 2018).
- Collaborations and Partnerships: Algeria collaborates with international organizations and development banks for funding and expertise in regenerative projects. Partnerships with entities such as the World Bank and the European Union on environmental and energy projects help manage risks through shared knowledge and resources (Gatzert & Kosub, 2015).

3. Examples of Algeria's Green Economic Projects:

- Investing in Renewable Energy: With the emergence of new changes affecting the energy sector in the international arena, Algeria is moving towards a balanced approach between the traditional capacities underlying the national economy . And a new kind of energy that you are betting on by pursuing an energy strategy based on investing in renewable energies, through the use of the induvtive method curriculum, this study aims to investigate issues of foring capital attraction for development Especially with the combination of traditional sources of energy with the essential characteristic of access and depletion that threatens the economy with potential crises, as well as the negative impact that overexploitation of these energies has on the ecosystem, emphasized by various scientific research and studies and the reports of various relevant international institutions. Algeria has begun to focus on the development of renewable energy sources such as solar and wind. Notable projects include the "Solar in the South" project, which aims to promote clean energy production and reduce dependence on fossil fuels (Garcia-Bernabeu et al., 2019).

- Sustainable Agriculture: Efforts are being made to improve farming methods through sustainable agricultural techniques, such as more efficient management of water resources, increased use of natural fertilizers, and the development of drought-resistant crop cultivation (Brown, 2019).
- Natural Resources Management: Efforts to conserve natural resources such as water and soil involve the application of sustainable management techniques and monitoring the impact of economic activities on the environment (UN DESA, 2024).
- Improving Waste Management :Algeria seeks to enhance waste management systems by promoting recycling, reducing waste, and improving the treatment of solid and liquid waste (World Bank, 2018).
- Sustainable Urban Development: There is a trend toward developing cities and urban areas sustainably by improving infrastructure, promoting public transport, and encouraging the construction of environmentally friendly buildings (Johnson, 2018).
- Innovation and Technology: Promoting innovation in environmental technology, such as developing techniques for cleaning water and soil and improving energy efficiency (Smith, 2020).
- Green Finance:Algeria promotes green finance by providing financial support for projects focused on sustainable development and offering incentives for investment in various environmental sectors (UN DESA, 2024).

To conclude my essay, I would like to highlight an exemplary organization in the field of environmental protection: Sonatrach, the National Society for Research, Production, Transportation, Transformation, and Marketing of Hydrocarbons. As Algeria's leading oil and gas company, Sonatrach has made significant advancements in its efforts to safeguard the environment.

Through various initiatives, including carbon capture and storage projects, the company demonstrates a strong commitment to reducing its ecological footprint while continuing to meet energy demands. This dedication positions Sonatrach as a model for other companies striving to balance industrial activity with environmental responsibility. Sonatrak is considering a climate strategy to reduce its carbon footprint towards a sustainable energy future at a total cost of $1 billion, a master plan for this strategy and accompanying guidelines. Algeria has made an important and sustained contribution to the global climate debate over the past three decades, and was thus one of the first participants in the process of reducing emissions. As reported, the energy sector is the largest contributor to global carbon emissions at 73%", and this gas has a future in the energy transition in Algeria, while ensuring that this gas is produced under environmentally friendly conditions.

This includes reducing various emissions, such as carbon dioxide and methane, and adopting consumption/offset processes to mitigate the environmental impacts of these emissions. In detail, this strategy is based on "climate governance" within the company and translates into "how to manage climate risks across Sonatrak's value chain," from upstream oil to commercialization. Therefore, as the Oil Group HSE Director says, there are tools to get rid of what's more important, reduce fugitive emissions including combustion, energy efficiency and compensat Planting 10 million shrubs to capture carbon The ultimate goal, according to the same source, is to achieve a balance between our emissions by 2050. "We already have commitments such as a -1% reduction in ignition for Algeria and our support for the World Bank initiative."

By reverting to the reduction of ignition, “it is not new; It’s been 30 years since Sonatrack invested in it. “These efforts must really be estimated and 28% since 2020 is equivalent to 1 billion standard cubic meters,” he says, ensuring that “this downward trend will be maintained by projects - which recover these oil-level gases upstream as well as in LQS activity, which is the main source of emissions in the oil sector - to meet our commitment.” In addition, with always environmental attention, Sonatrach National will launch a large-scale reforestation pilot project aimed at planting 10 million shrubs on an area of 10,000 to 13,000 hectares, to absorb carbon, the speaker announced, this project will be implemented in partnership with the Directorate General of Forestry (DGF), which will identify appropriate tree species and select sites for farming in the national forest area. According to Sonatrak’s Central Director of HSE, this pilot project will eventually cultivate more than 420 million trees over an area of 560 000 hectares and create thousands of jobs.ion for all consumption.(www.radioalgerienne.com).

Conclusion

In conclusion, the government’s approach to risk management in renewable economic projects is critical for fostering sustainable development and attracting investment. Effective risk management strategies must address a multitude of risks, including political, economic, technical, and social factors. Algeria has developed comprehensive strategies to address economic challenges. economic diversification “, which historically depended on the oil and gas sector, recognized the importance of economic diversification and adopted policies focused on the sustainability of economic development.

In addition, efforts to improve natural resource management, promote environmental awareness and promote technological innovation demonstrate Algeria’s commitment to achieving sustainable development that balances economic growth with environmental conservation.

However, significant challenges remain to be overcome, such as improving the business environment and developing human capacities. Algeria needs to further strengthen its strategies and develop its capacity to address risks and achieve the goals of sustainable economic development.

Overall, Algeria’s efforts in managing economic risks and renewal point to positive trends towardslong-term economic sustainability, reflecting its com mitment to developing comprehensive strategies that support sustainable growth and contribute to building a strong and diversified economy.

By adopting comprehensive frameworks that incorporate stakeholder engagement and innovative risk mitigation techniques, governments can enhance the resilience of renewable energy projects against uncertainties.

Strengthening collaboration with stakeholders can further improve risk identification and management processes. Engaging local communities and industry experts from the project’s inception can lead to more robust risk assessments and solutions tailored to specific challenges.

Incorporating Environmental, Social, and Governance criteria into project planning and execution can enhance sustainability and investor confidence, ultimately leading to more successful outcomes.Continuous Learning from Past Projects: Establishing a feedback loop that captures lessons learned from previous projects will allow for continuous improvement in risk management practices. This approach can help identify common pitfalls and effective

strategies that can be applied to future initiatives. By focusing on these areas for extension and improvement, governments can not only mitigate risks but also create a more favorable environment for renewable energy investments, thus contributing significantly to global sustainability goals.

tion growth, especially due to the influx of refugees as a result of geopolitical conditions in the region. Droughts are expected to become more severe, particularly in the Mediterranean region, with statistics showing worsening conditions in Morocco, Tunisia, and Algeria. Crop yields are significantly reduced in some areas, and without adaptation measures, the region faces reduced agricultural productivity. For example, barley yields in Jordan are projected to decline by 22%, and wheat yields in Syria may decrease by 23%. High temperatures are also expected to spoil food more quickly, which, combined with limited refrigerated storage, further threatens food security. However, investing in new technologies and drought-resistant crops can counteract some of these disruptions.

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Country
Kenya

How Kenya should act to stop Climate Change effects on the economy

Abstract:

Climate change is a long-term change in earth's weather patterns affecting local, regional, and global climates. It is driven by human activities, especially fossil fuel burning that ends up increasing greenhouse gases, raising earth's surface temperature hence affecting agriculture and other sectors. It affects Kenya, a country that has been facing adverse effects of climate change such as drought and floods, main climate hazards, that negatively continue to impact lives and livelihoods and economies. In the past years, Kenya has seen major droughts and floods that have intensified and become more frequent, while the financial and technical capacity to adapt to climate change and natural hazard continues to be limited.

Climate change is the greatest food challenge of the 21st century for the country. The mean temperature is increasing rapidly and other climatic variables are worsening in Kenya. Climatic hazards are fueling environmental degradation, natural disasters, weather extremes, food and water insecurity, economic disruption and conflicts.

The consequences for agriculture, the backbone of Kenya's economy is substantial and include more deadly extreme weather events, increasing cases of drought and increased hunger. This is already impacting the country's regions especially in arid and semi-arid ones. While climate change also affects countries who have contributed the least like Kenya to causing the crisis whereby it forces people to live in poverty as their food sources are interfered with. Journalists should be involved to transit information on the dangers of climate change to explain it to populations as it shapes a positive manipulation, maintenance and development of society for good intentions.

Keywords:

Climate Change, Economy, Stop, Effects, Farmers, Pastoralists, Crops, Livestock, Water, Floods

Introduction

Kenya is a lower middle-income country with an estimate Gross Domestic Product (GDP) of USD 82 billion in 2027 and aspires to be a newly industrializing, middle-income country providing a high quality of life to all its citizens by 2030 in a clean and secure environment. The country's economy is dependent on rain fed agriculture, water, energy, tourism and wildlife, sectors that are sensitive to the vulnerabilities that increases daily by climate change.

Agriculture, plays a critical role in ensuring food and nutrition security for the Kenyan population. According to the 2021 country's Economic Survey, the sector contributed approximately 23 per cent of total GDP and an additional 17.1 per cent to GDP through linkages to other sectors such as manufacturing, distribution and services in the year 2020.

It contributes approximately 75 percent of industrial raw materials, 65 percent of export earnings and 60 percent of the total employment. The sector employs more than 40 percent of the total population, approximately 70 percent of the rural population and is the principal source of rural incomes and livelihoods.

Kenya earned shillings 157 billion in 2021 from horticulture export and also continue to earn lots of income from tea, coffee, cut flowers, tropical fruits, spices, live trees, plants, nuts, animal/vegetable fats, oils, gums and resins and vegetables.

Literature Review

The Kenya Bureau of Statistics says that Kenya's population that currently stands at 52,428,290 will surpass 100 million people by the end of 2058 and will reach 125 million by the end of the century. This increase of population means that Kenya will require additional food to feed the additional mouths hence a call for action in an effort to managing the upsurge of climate change measures. According to the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and Kenya National Disaster Response Centre (NDOC) an estimated 315 people were killed, 188 injured, and 38 missing, while more than 293,200 people (58,641 families) were displaced and nearly 306,520 (61,304 families) were affected by heavy rains and floods between 1 March and 18 June 2024.

Economides, G., et al, June 2018, the Economics of Climate change, the implications of climate change for the society and sustainable development are such that there is no need to continue with 'business as usual' scenario. There is need to mitigate and shift to lower carbon economy, but also manage risks and adapt to the changing climate.

The researchers notes that historically, climate change can be attributed primarily to the actions of the large industrialized countries but, its impacts are diffused to non-industrialized, small as well as large countries.
Boyd, R. and Markandya, A, 2021, costs of climate change and adaptation, chapter 6, in Canada in a changing climate, says that climate change results in a wide range of direct and indirect costs with numerous economic and social implications.

Costs associated with damage from extreme weather events are significant and rising largely due to growing exposure and increasing assets values. While climate change presents benefit through carbon credits, the associated

climate impacts are overwhelmingly negative. Actions to adapt to climate change can deliver significant co benefits in other areas, as well as a result in unintended costs.

Ackerman, F and Stanton, E (2008), the cost of climate change says that the global warming comes with a big price tag for every country around the world. They note that drought, floods, wildfires and hurricanes have already caused multibillion dollar losses and these extreme weather events will likely become more frequent and more devastating as the climate continues to change. Household budgets as well as business balance sheets will feel the impact of hunger energy and eater costs. For countries that have fewer resources with which to fend off the consequences of climate change, the impacts will be devastating.

Mirzabaev, A. et al, (May 2021), Summit, Climate Change and Food Systems says that the interactions between climate change and food systems have considerable repercussions across all of the dimensions of sustainable development. In fact, in six of the 17 sustainable development goals (SDGs), climate change food systems interactions increasingly play a major role. These relate to the social goals of zero hunger (SDG 2) and gender equality (SDG5), and the four environmental goals of water resources (SDG 6), climate action (SDG 13), life below water (SDG 14), and life on land (SDG 15). Solutions addressing the challenges posed by climate change - food systems interactions can serve as a critical entry point for promoting the 2030 Agenda for sustainable development well beyond the timeline of the current SDGs 9. Since these interactions vary according to the country's income, region, and population groups (gender, age, and location of its population), solutions prioritizing women, younger, and rural people, i.e., "leaving no one behind," can better leverage achievements of SDGs.

Over the last decade, Kenya has been experiencing successive impacts of climate change resulting to great socio-economic loss estimated at 3-5 percent of GDP annually and impending development efforts.

Despite the country's negligible contribution of GHG emissions, less than 0.1 percent in 2018, the country has put up ambitious policies and measures to pursue low carbon climate resilient development pathways to realize vision 2030.

In 2022, Kenya launched a tree planting policy to plant 15 billion trees by the year 2032. This policy is aimed at reducing Greenhouse Gass (GHG) emission, stop and reverse deforestation and restore 5.1 million hectares of deforested and degraded landscape.

The country has however, adopted policies, acts and technologies leading to a low carbon country. It has also had numerous campaigns on tree planting over the years, such as the 'Million Operation Gavisha' (1977), Trees Campaign (2006), The Greening Kenya Initiative (2010) and the Accelerated National Tree Growing Campaign (2022).

Kenya also has elaborated legal frameworks to protect forests and promote tree planting namely, the Kenya Forest Policy (2014), Land Act (2012), Forest Conservation and Management Act (2016) and the National Climate Change Response Strategy seek to address how the country can increase tree cover. Kenya's nationally Determined Contributions (NDC) target a requirement by the United Nations Framework Convention on Climate Change (UNFCCC), to abate Greenhouse Gas (GHG) emissions by 32 percent by

2030 in line with then global Sustainable Development Goals (SDGS) is on course.

Kenya has been responding to extreme weather events by distributing famine relief food, El Nino response programmes and animal off take programmes. Increased intensities and magnitude of climate related risks in Kenya aggravate conflicts mostly over natural resources. This has frequently forced the government to reallocate development resources to address climate related emergencies. Since the total cost of implementing mitigation and adaptation actions is estimated to cost USD 62 billion. Kenya commits to mobilize 13 percent of this budget and will require international support for 87 percent of the budget.

Kenya is a member of the Africa Green Climate Finances Designated National Authorities Network (AfDAN) that has been established to enhance mobilization of climate finance, make it more readily accessible to support Africa in enhancing adaptive capacity and building resilience of people both in the rural and urban set ups through locally led solutions.

Kenya continues to face myriad challenges associated with adverse climate change effects and consequently, the vulnerable segment of the population, particularly the poor in both rural and urban communities, continue to bear the brunt of climate change. The East African nation has embarked on the two key programmes which resonates with the its needs, notably, financing Locally Led Climate Actions (FLLoCA) and Building Climate Resilience of the Urban Poor (BCRUP) at the rural and urban levels.

FLLoCA programme was established to build climate resilience of communities within the 47 counties of Kenya to ensure that the country is prioritizing locally led solutions to its challenges on climate change. Tourism, agriculture and other weather dependent industries survival is at stake and the countries revenue generation.

However, the possible effects of climate change on food production are not limited to crops and agricultural production. Climate change too has a far-reaching effect for dairy, meat and wool production, mainly arising from its impact on grassland and rangeland productivity. Heat distress suffered by animals in Northern and North Eastern Kenya will reduce the rate of animal feed intake and result in poor growth performance.

Lack of water and increased frequency of drought in certain some parts of the country are to blame for the loss of resources, pasture and water. Consequently, existing food insecurity and conflict over scarce resources has increased in the recent past.

Mirzabaev, A. et al, (May 2021), Summit, Climate Change and Food Systems says that climate change will affect food systems differentially across world regions. While some areas, such as northern temperate regions, may in the short term even experience some beneficial changes, tropical and sub-tropical regions worldwide are expected to face changes that are detrimental to food systems. Such changes will have effects on food and nutrition security through a complex web of mechanisms. Critical climate variabilities that affect food and nutrition security include increasing temperatures, changing precipitation patterns and greater frequency or intensity of extreme weather events such as heatwaves, droughts and floods. They impact the productivity of crops, livestock and fisheries by modulating water availability and quality, causing heat stress, and altering the pests and disease environment, inclu-

ding the faster spread of mycotoxins and pathogens. Increased frequency and intensity of floods and droughts can lead to considerable disruptions in food supply chains through harvest failures and infrastructure damage.

Ahmed J., et al (2020), Agriculture and climate change, reducing emissions through improved farming practices says that the agriculture sector has a complicated set of objectives to consider alongside climate goals, including biodiversity, nutritional need, food security, and the livelihood of farmers and farming communities. Throughout the course of human history, agriculture has responded to humanity's greatest challenges. The sector has increased food production to a level that many believed impossible. The sector now has an opportunity to make yet another major contribution to humanity's success during this crucial window for action.

Defining Research

Kenya's economic lifeline is dependent in rainfed agriculture that contributes approximately 75 percent of industrial raw materials, 65 percent of export earnings and 60 percent of the total employment. The sector employs more than 40 percent of the total population, approximately 70 percent of the rural population and is the principal source of rural incomes and livelihoods. The sector contributes approximately 23 per cent of total Gross Domestic Product (GDP) and an additional 17.1 per cent to GDP through linkages to other sectors such as manufacturing, distribution and services in the year 2020. The country earned shillings 157 billion in 2021 from horticulture export and also continue to earn lots of income from tea, coffee, cut flowers, tropical fruits, spices, live trees, plants, nuts, animal/vegetable fats, oils, gums and resins and vegetables.

But this gain is currently under threat due to effects of climate change on food production that continue to dwindle due to unreliable rainfall that has leads to low production of dairy, meat and wool production, mainly arising from its impact on grassland and rangeland productivity. Heat distress suffered by animals in Northern and North Eastern Kenya will reduce the rate of animal feed intake and result in poor growth performance. Kenya has been experiencing successive impacts of climate change resulting to great socio-economic loss estimated at 3-5 percent of GDP annually and impending development efforts.

The country's leadership has launched a tree planting policy to plant 15 billion trees by the year 2032 to help reduce Greenhouse Gass (GHG) emission, stop and reverse deforestation and restore 5.1 million hectares of deforested and degraded landscape and be able to attract reasonable rainfall to sustain agriculture. The country has however, adopted policies, acts and technologies leading to a low carbon country.

It has elaborated legal frameworks to protect forests and promote tree planting namely, the Kenya Forest Policy (2014), Land Act (2012), Forest Conservation and Management Act (2016) and the National Climate Change Response Strategy seek to address how the country can increase tree cover. Of course, forests can play a vital role in ensuring temperatures remain within the 1.5C target agreed under the Paris Agreement – capable of delivering a third of the emissions reductions needed to meet the 2030 climate goals. Of course, forests can play a vital role in ensuring temperatures remain within the 1.5C target agreed under the Paris Agreement – capable of delivering a third of the emissions reductions needed to meet the 2030 climate goals.

The basic hypothesis in this paper is that even though Kenya has put measures in place and continue path of confronting climate change so as to save agriculture sector, the main economic sector from collapse, the effort must be supported by the media as a platform for creating awareness to populations. Empowering of Journalists on reporting of climate change now comes in handy to enable them understand what climate change is all about – its effects on agriculture, all sectors and the general economy of a country.

Creating Research Design For Kenya to sustain its agricultural productivity against the increasing climate change there is need to care for the vulnerable, use science and data to boost resilience and limit global temperature rise to 1.5 degrees Celsius – to stop the problem getting unimaginably worse.

In all this there is urgent need to retrain Journalists to have knowledge on climate change to make them literate on the dangers of climate change on the country's economy to inform populations to make informed decisions and be part of the government initiatives.

Conclusion

Kenya should mobilize populations to plant trees to help reduce the impact of climate change since trees not only helps combat climate change by sequestering carbon dioxide, but it also provides a wide array of environmental, social, and economic benefits including providing water for farming.

There should also be a change in plantation of trees from areas that were previously forested, and in most cases with relatively good amounts of rainfall to arid and semi-arid lands, despite covering up to 89 percent of the country land, but have not been fully exploited.

Tree growing policies need to be integrated within the broader environmental and urban planning policies to ensure that tree care and management are considered in land-use decisions, urban design, and infrastructure development.

The coordination of relevant policies such as urban forestry plans, climate action plans, and green space development strategies will also help in achieving the targets as well as adoption of carbon trading by communities in Kenya can increase revenue and help improve tree coverage hence help improve the country's economy.

To effectively move towards the 30 percent tree cover, Kenya must start by incorporating environmental education into the school curricula while community outreach programmes can foster a sense of environmental stewardship and empower individuals right from the young age.

It is now practically impossible to fully adapt to climate change impacts. Even without climate change, extreme weather events periodically inflict significant disruptions in food systems at the local, regional and even global levels. Climate change will make these disruptions more frequent and more extensive. Therefore, it is essential to strengthen the social protection for vulnerable populations in terms of accessing food during the times of such disruptions. Social protection can involve many forms such as access to subsidized food banks, transfers, insurance products, cash pension schemes and employment guarantee schemes, weather index insurance, and universal income.
Since it has been proven beyond doubt by scientists that climate change is real and is already devastating both agricultural and livestock farmers, the

government need to promote the growing of indigenous seeds and drought tolerant crops to save populations suffering from hunger alongside putting emphasis on the country's major climate change interventions.
Kenya should encourage healthy and sustainable diets by transitioning to more healthy and sustainable diets and minimizing food waste to reduce global mortality from 6 percent to 19 percent and food-related GHG emissions by 29–70 percent by 2050.

The country has to diversify and move away from over-reliance of donor funding for environment activities by embarking on domestic fund-raising initiatives. This domestic public private partnership approach should target few philanthropists and industries to supplement what the government is already doing.

For African nations, Kenya included, and people to seize the opportunities and reduce the risks, everyone will need to know more about climate change as opposed to listening to myths and misinformation. The way the media covers it will affect how well societies deal with the problem. Climate change will become increasingly important to African Journalists, and African Journalists will become increasingly important to the global response to climate change. Wise and responsible media managers will see that climate change presents an opportunity to grow and better serve these audiences. Three of the media's traditional roles — informing audiences, acting as watchdogs and campaigning on social issues — are especially relevant. Coverage of climate change in Kenya, like in any other developing country, means saving lives, change of policy and empowering people to make informed choices. Such informed reporting, Journalists tell stories of activities that people are already undertaking to prepare for climate change.

The media, therefore has to upscale its coverage of climate change from its traditional mainstream media to community medias. This approach will empower populations since community media, mainly radio and television are presented in local dialects, that is well understood by as many educated and uneducated together.

In this course, Journalists should educate populations on the dangers of climate change by featuring the degradations that it causes. They have to ensure that populations get information and at times focus on opportunities that is brought about by climate change such as green jobs and food security. Focus on prospects through good story telling resonates well with communities, the youths and women too.

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The Impact of Family Farming on Climate Change in Rwanda and Globally

Abstract:

Family farming is an important factor in food production in many parts of the world and the development of rural people's livelihood, it has become high on the political agenda, especially in the developing countries of the world such as Rwanda. Family Farmers Face Unique Combination of Challenges and Opportunities in Climate Change The report details a complex duality of family farming as an important sector that contributes to climate change, and at the same time one that can also provide natural solutions to mitigation-targeting Rwanda, drawing on examples from across the world.

Agriculture in Rwanda is the backbone of its economy, as most of its rural population is attached to small-scale and subsistence family farms. Climate change enhances all vulnerabilities, including those around food security and sound economies. These include, among others, irregular rainfall, droughts, and soil deterioration. Even amidst these challenges, family farming continues to contribute to climate change mitigation through carbon sequestration, restoration of degraded lands, and biodiversity enhancement through agroecology-based practices like agroforestry and conservation of soil.

This essay examines climate change's impacts on family farming in Rwanda and globally, describes measures to adapt to those effects, and promotes the idea that family farmers may even provide solutions for mitigating climate change. It also examines how international organizations, NGOs, and local government policies can help family farmers strengthen climate-smart agriculture and resilience.

Keywords:

Family farming, Climate changes, Rwanda, Global, Sustainable agriculture, Environmental impact, Climate adaptation, Food security

Introduction
Overview of Family Farming

Family farming plays a key role in Rwanda's agricultural countryside and has larger implications for climate change, both within Rwanda and worldwide. As a primary source of food, income, and cultural identity for many Rwandans, family farming is linked with the nation's social fabric. However, its influence on climate change involves both potential benefits and challenges that merit comprehensive examination. Family farming refers to the small-scale agricultural activities mainly conducted by a family, using family labor, and usually oriented toward production for local food markets or their subsistence. It is an important sector in the global food system.

Context in Rwanda

Family farming plays an important role in Rwanda's economy, especially in contributing to food security, rural livelihoods, and employment opportunities within the country. However, family farming is faced with specific challenges emanating from climate changes that include conditions such as drought and flooding, which degrade the soil conditions. Rwanda Agriculture and Animal Resources Development Board (RAB) said that In Rwanda, changing rainfall patterns, increased temperatures, and extreme weather events such as droughts and floods have become increasingly common, as crop pests and diseases. (RAB (Minagri, Rwanda, National Crop Monitor,2021, (N0 5) page 1-2, 2021 (Minagri, Rwanda, National Crop Monitor,2021, (N0 5) page 1-2, 2021), n.d.).

The National Crop Monitor Magazine shows that these changes threaten food production, exacerbate poverty, and can lead to displacement. Family farming is particularly vulnerable to these impacts due to the reliance on rainfed agriculture and limited adaptive capacity. (Minagri, 2021)

Overview of Family Farming in Rwanda

Family farming in Rwanda encompasses smallholder farms, typically operated by families with limited resources. These farms produce a diverse array of crops, including staples such as beans, cassava, and maize, alongside cash crops like coffee and tea. According to the Food and Agriculture Organization (FAO), approximately 70% of Rwandans are engaged in agriculture, primarily within family units. This model of farming is not only crucial for food security but also for sustaining livelihoods in rural areas. . (FAO, n.d.)

Ministry of Agriculture and Animal Resources said that in September 2021, the late rain caused big challenges for the farmers. The harvest of maize, beans, and rice was very low quantity. In the districts of Kayonza, Ngoma, Nyarugenge Gatsibo, Rwamagana, and Nyanza, the Ministry put other production to handle these challenges faced by farmers. (Minagri, 2021)

Mitigating Climate Change through Family Farming

Despite these vulnerabilities, family farming can also contribute to climate change mitigation through various sustainable practices. Agroecology, organic farming, and agroforestry are increasingly recognized as effective strategies to enhance resilience while reducing greenhouse gas emissions.

1. Agroecology

The Rwanda Environment Management Authority (REMA) affirms that the country's biodiversity faces various threats that have led to the loss of species shrinkage in population size and ecosystem degradation. Genetic material is any material of plant, animal, microbial, bacteria, or other origin used for research or product development. To know and understand the diversity present in the country, an inventory of plant, animal, and aquatic genetic resources must be carried out. In Rwanda, there is a rich history of traditional knowledge related to medicinal plants, agriculture, animal husbandry, food storage, natural resource management, ecological systems, and wildlife. Most of this knowledge is oral and passed from generation to generation usually within families. With a growing market need for 'nature-based' cosmetics, medicines, and pesticides, there is a constant search for new plants, microbes, and animal parts (Genetic Resources) that can be commercialized or purely researched, and knowledge of local communities on how to utilize or maintain these genetic resources (associated Traditional Knowledge) are helpful 'strings' for identifying claims. (REMA, n.d.)This holistic approach to farming incorporates ecological principles to promote biodiversity, enhance soil fertility, and improve water management. By diversifying crops and integrating livestock, family farms can create resilient ecosystems that are less susceptible to climate impacts.

2. Agroforestry

The Rwanda Walter portal said that Integrating trees into agricultural landscapes can significantly mitigate climate change. Trees sequester carbon, improve soil health, and provide shade and shelter for crops and livestock. In Rwanda, initiatives promoting agroforestry have shown promise in enhancing biodiversity and improving farmers' resilience to climate variability. Restoring the soil and improving the productivity of the agricultural land is the overall goal of land husbandry. Investing in land husbandry increases resilience to climate change, reduces water erosion and soil loss, halts land degradation, and increases land productivity. Land management techniques include soil bunds, terraces, cut-off drains land husbandry practices for both rain-fed and irrigated agriculture for higher crop production. Rwanda's climate change vulnerability originates in the mountainous character of the country with an inherent susceptibility to soil erosion, combined with a strong reliance on rain-fed agriculture representing 34% of Rwanda's GDP (GDP 2014) and employing 90% of its inhabitants (both directly and indirectly). This leaves the country in a challenging position concerning climate change adaptation. As the temperature increases, Rwanda's historically predictable rainy seasons are becoming increasingly unreliable and short, resulting in more frequent droughts and higher intensity rains with the potential of causing progressively significant economic damage to crop yields and infrastructure. (agroforestry, n.d.)

3. Organic Practices

Family farms that adopt organic farming practices contribute to climate change mitigation by reducing reliance on chemical fertilizers and pesticides, often derived from fossil fuels. Organic practices enhance soil carbon storage and promote healthy ecosystems.

Adaptation Strategies

To effectively fight climate change, family farmers in Rwanda must also adopt adaptive plans that permit them to handle the changing environment. These strategies include:

1. Crop Diversification
By cultivating a variety of crops, farmers can reduce the risk of crop failure and enhance food security. This practice also encourages biodiversity and can make ecosystems more resilient to climate impacts.

2. Water Management
Improved water management techniques, such as rainwater harvesting and drip irrigation, can help family farmers cope with the variability of rainfall patterns. Efficient water use is crucial in mitigating the effects of droughts and ensuring sustainable agricultural practices. Rwanda Walter Portal said that the Farmers generate 90 % of the economic activity in rural areas producing food and fuel to improve livelihoods and are key to national food security. Together the farmers manage over 80% of the lands under forest and agriculture in the catchment and biggest water users. Farmers are the manager of the catchment on the ground and custodians of the natural ecosystems. Restoring the soil and improving the productivity of the agricultural land is the overall goal of land husbandry. Investing in land husbandry increases resilience to climate change, reduces water erosion and soil loss, halts land degradation, and increases land productivity. Land management
techniques include soil bunds, terraces, cut-off drains land husbandry practices for both rain-fed and irrigated agriculture for higher crop production. (agroforestry f. a., n.d.)

3. Education and Training
Empowering farmers with knowledge about climate-smart agriculture is essential. Training programs that focus on sustainable practices, risk management, and innovative farming techniques can improve resilience and productivity. The education on environment in general begins from pre-primary up to secondary school. According to the Article 22 of Rwandan Law N°48/2018 of 13/08/2018 stipulates that, in matters related to education on environmental conservation and climate change, the state shall take “adequate measures aimed at the education on the conservation of the environment and adaptation to the impacts of climate change and integrates the same in schools curricula at all levels” (p.26). The country’s National Environment and Climate Change Policy (2019) also aims to mainstream climate change in primary, secondary, and tertiary-level education curricula. The mainstreaming of climate change education into the learning materials from primary to secondary is done by the Environment and Climate Change Mainstreaming Group of the Rwanda Environment Management Authority (REMA), in collaboration with other institutions such as the Ministry of Education. ((Rwanda, n.d.) The United Nations Education Scientific and Cultural Organization affirms that In Rwanda, integration of climate change from pre-primary to upper secondary education occurs through the 2015 National Curriculum Framework (NCF). The Rwanda Education Board (REB) also affirms that in his book. REB said that The NCF emphasizes the integration of cross-cutting issues of climate change, environment, and sustainability into the learning materials to develop learners. (REB, 2019),

The 2019-2024 Education Sector Strategic Plan also emphasizes the integration of climate change into the curriculum to develop sustainable skills, knowledge, and values. The Plan states:

The competency-based curriculum will also ensure that learners acquire adequate understanding and positive implementation strategies for environmental factors affecting climate change. The key focus will be the acquisition of the knowledge and skills necessary to mitigate environmental risks and for environmental responsibility to be taken by all. (p. 48)

Rwandan Agricultural Landscape
Agriculture is the backbone of Rwanda's economy, with more than 70% of its population depending on family farming as their main source of livelihood. Major crops grown in Rwanda include beans, maize, potatoes, and cassava.

Climate Change
Impact on Rwandan Family Farms Rising temperatures, unpredictable rainfall patterns, and soil erosion are some of the conditions that still affect Rwanda negatively in terms of agricultural activities. Crop failure brought on by shifting weather systems affects food security and economic stability. Some farmers face starvation.

Adaptation Strategies
The Government of Rwanda has been piloting climate-smart agriculture to help increase resiliency. These will involve diversification of crops, enhanced irrigation techniques, agroforestry, and utilization of drought-resistant varieties.

Policy Responses
Government support programs target family farmers through various initiatives, such as the National Adaptation Programme of Action and the Green Growth and Climate Resilience Strategy. In this support program, The Rwanda Environment Management Authority (REMA) said The structure of the agriculture sector will evolve as the population grows and with increasing pressure on land for other purposes (including housing) and individual smallholder plots transitioning to consolidated rural settlements. Agricultural land will be assessed based on criteria including soil quality, water availability, nutrients, potential yield, and crop diversity. Agricultural value chains will be developed to support the development of processed goods for high-quality domestic and international exports, with improved cold storage, logistics, and post-harvest manufacturing infrastructure to access markets and reduce post-harvest losses, (REMA, Rwanda Green Growth and Climate Resilience Strategy)

Global context
Family farming is a worldwide phenomenon, and its relation with climate change has become increasingly crucial. Family farmers, in the course of climate change, often confront situations of vulnerability and potential strategies for building resilience.

Family Farming and Climate Change: A Global Perspective

Poster Global Contribution to Agriculture and Emissions Family farms are a significant portion of world agriculture. They can contribute up to 70-80% of global food production and at the same time contribute greatly to greenhouse gas emissions through activities such as livestock farming, deforestation, and intensive farming practices.
Poster challenges for Family Farmers Globally

Climate change increases the vulnerability of family farms to severe climate events, such as droughts, heat stress, and unpredictable rainfall patterns. The chapter discusses major vulnerabilities, especially in developing countries. Family farmers can also play a critical role in mitigating climate change through practices of agroecology, sustainable land management, and carbon sequestration.

Family Farming in a Changing Climate in Rwanda
The Contribution of Family Farmers to Climate Change Mitigation

Agroecology and Carbon Sequestration

Family farmers have great potential to effectively contribute to mitigating climate change with the use of agroecological methods that enhance biodiversity, soil health, and carbon sequestration. This includes organic farming, agroforestry, crop rotation, and reduced use of chemical inputs. While the impact of family farming on climate change is evident at the local level in Rwanda, it also has global implications. The interconnectedness of agricultural systems means that practices in Rwanda can influence global climate trends.

Restorative agriculture:

Sustainable family farming practices can significantly contribute to global carbon sequestration efforts. The adoption of agroecological methods and reforestation initiatives can enhance carbon storage in soils and vegetation, helping to mitigate global warming. Food and agriculture organizations said that the Management of soil fertility and organic matter, and improvement of the efficiency of nutrient inputs, enable more to be produced with proportionally fewer fertilizers. It also saves on energy use in farming and reduces emissions from the burning of crop residues. Moreover, it helps sequester carbon in soil. Avoidance of tillage minimizes the occurrence of net losses of carbon dioxide by microbial respiration and oxidation of the soil organic matter and builds soil structure and bio pores through soil biota and roots. Maintenance of a mulch layer provides a substrate for soil-inhabiting microorganisms which helps to improve and maintain water and nutrients in the soil. This also contributes to a net increase of soil organic matter - derived from carbon dioxide captured by photosynthesis in plants, whose residues above and below the surface are subsequently transformed and sequestered by soil biota. (FAO, Climate-Smart Agriculture: Policies, Practices, and Financing for Food Security, Adaptation and Mitigation, 2014).

1. Biodiversity Preservation:

Family farms often maintain diverse agricultural systems, which are vital for global biodiversity. By preserving local seed varieties and traditional farming practices, family farmers play a crucial role in maintaining genetic diversity, which is essential for food security in the face of climate change.

2. Food Security and Resilience:

Compacting family farming systems globally can contribute to food security, reducing reliance on industrial agriculture, which is often linked to high carbon emissions and ecological degradation. A shift toward sustainable family farming can improve global resilience to climate change by promoting local food systems that are less exposed to global market fluctuations. In his report, the Food and Agriculture Organization (FAO) shows that Trees can improve soil fertility and soil moisture by increasing soil organic matter. Nitrogen-fixing leguminous trees and shrubs can be especially important to soil fertility where there is limited access to mineral fertilizers. Improved soil fertility tends to increase agricultural productivity and may allow more flexibility in the types of crops that can be grown. For example, agroforestry systems in Africa have increased maize yields by 1.3 and 1.6 tons per hectare per year. Fodder trees have been traditionally used by farmers and pastoralists on extensive systems but fodder shrubs such as calliandra and leucaena are now being used in more intensive systems, increasing production and reducing the need for external feeds Agroforestry systems for fodder are also profitable in developed countries. For example, in the northern agricultural region of Western Australia, using tagasaste (Chamaecytisus proliferous) has increased returns

to farmers whose cattle formerly grazed on annual grasses and legumes. (FAO, Climate-Smart Agriculture: Policies, Practices, and Financing for Food Security, Adaptation and Mitigation, 2014).

Challenges and Future Directions

Despite the possible benefits, family farming in Rwanda faces several challenges that hinder its effectiveness in combating climate change. Limited access to financial resources, markets, and technology can restrict farmers' ability to adopt sustainable practices. Additionally, climate change itself poses a significant barrier to traditional farming methods. Agriculture Climate change is a threat-multiplier to agriculture, enhancing risks already felt from climate variability, particularly through changes in the availability of water (a fundamental input in a country reliant on rain-fed agriculture) and through temperature shifts that affect crop growing patterns (crop growth cycles are influenced by temperature, and productivity of some crops drops after a certain temperature threshold is breached) The World Bank planned to support the country. Rwanda is already starting to experience more extremes, with the dry regions in the east and south becoming more arid (and projected to see more droughts), and wet regions in the north and west becoming more humid and moister (and projected to see more floods and landslides) (Minagri, PSTA 4, Rwanda Strategies plan for agriculture transformation 2018, 2018).

Some assessments suggest that climate impacts in Rwanda such as higher temperatures, increased dryness (in some regions), and higher evapotranspiration, may alter the extent of areas suitable for agriculture and the length of growing seasons, affecting crop yields (e.g., for tea, coffee, maize, beans, wheat, fruit, and groundnuts) as well as hunger and nutrition (Minagri, STRATEGIC PLAN FOR AGRICULTURE 2018 -2024) Furthermore, there is a higher risk of soil erosion due to more extreme rainfall events in certain regions. In addition, climate change.

Otherwise, the world has the same challenges concerning climate change. For example, The Mediterranean region hosts exceptional biological diversity and socio-cultural richness from three continents. The nature of the semi-enclosed Mediterranean Sea and the complex topography imply unique physiographic and ecological features. The region has undergone continuous changes in human activities over several millennia and now hosts more than 500 million people, with a high concentration of urban settlements and industrial infrastructure close to sea level. The region is the world's leading tourist destination and one of its busiest shipping routes. Climate change strongly interacts with other environmental problems in the Mediterranean Basin, resulting from urbanization, land use change, overfishing, pollution, biodiversity loss, and degradation of land and marine ecosystems. (Change, 2022).
Previous Intergovernmental Panel on Climate Change (IPCC) reports have never assessed the Mediterranean region as an entity – but they have shown that virtually all parts of it are vulnerable and face significant risks due to climate change. Identified regional key risks include increased water scarcity (notably in the south and east) and droughts (in the north), coastal risks due to flooding, erosion, and saltwater intrusions, wildfire, terrestrial and marine ecosystem losses, as well as risks to food production and security, human health, well-being, and cultural heritage. (Change I. P., 2022).

To overcome these challenges, stakeholders-including governments, NGOs, and international organizations-must invest in infrastructure, education, and

research to support family farmers. Policies that promote sustainable agricultural practices, provide access to financing, and facilitate market connections are essential for fostering resilience in the face of climate change. Progress towards the achievement of the United Nations Sustainable Development Goals differs strongly between Mediterranean sub-regions, with northwestern countries having stronger resilience than southern and eastern countries (high confidence). To equitably enhance regional adaptive capacity and sustainable development, while safeguarding the rights of the most vulnerable people, regional cooperation can be strengthened with a focus on the link between adaptation, costs and financial limitation, and climate justice (high confidence). Cooperative policies across various sectors, involving all user groups and considering all regional and sectorial differences may enhance sustainable resource use in the region (high confidence).(changes, 2022).

Local Knowledge and Innovation
Locally, farmers develop detailed knowledge of their environment and can provide innovations and solutions to climate change. This knowledge, together with modern scientific techniques, helps to reduce the adverse impacts of climate change.

Reforestation and Soil Conservation
Agroforestry, in addition to reforestation and soil conservation methods, contributes to positive performance in fighting against climate change. The agreement is that through such agroforestry practices, family farmers can restore degraded lands, enhance carbon sinks, and contribute to global.
Climate objectives

International Organisations and NGOs

Global Climate Agreements and Support to Family Farmers International agreements such as the Paris The agreement recognizes that attaining climate objectives is impossible without the contribution of small-scale farmers. The Global Environment Facility - GEF - and the Food and Agriculture Organization - FAO - are examples of initiatives that provide funding and technical support to family farmers.

NGO Initiatives
Most NGOs are directly involved in the implementation of climate adaptation and mitigation strategies for family farmers through access to climatic-resilient seedlings, improved water management, and sustainable farming practices amongst others.

International Funding and Partnerships
Donor agencies and multilateral development banks have been funding climate resilience programs targeting family farmers, especially in developing nations like Rwanda.

Case Study: Family Farming in Rwanda Adaptation Practices National Adaptation Programme of Action (NAPA)

This NAPA focuses on the issues of vulnerability reduction and resilience enhancement through climate-resilient farming methods. Thus, it has contributed to several on-farm best practices in water management, crop diversification, and sustainable farming among farmers in Rwanda.

Agro-ecological Practices in Rwanda

Agroecology has been implemented across different regions of Rwanda, whereby farmers integrate livestock with crop production and implement techniques of soil conservation, organic farming, and water harvesting. The potential agroecology for youth in Rwanda shows measures to reduce vulnerability to climate change. These measures reduce vulnerability to climate change, hence maintaining soil health and improving its productivity. Efforts to enhance the ecological sustainability of agricultural practice are hampered by limited policy attention and low farmer investment capacity. The development of agroecological practice encounters several additional challenges. These include the generally limited awareness of the existence of organic products and the lack of certification, the lack of market limiting the production of organic products, the limited involvement of the private sector, the research and policy gaps in agroecology, and lack of financing for those wishing to enter the sector. (YALTA)

Community-Based Adaptation

On the side of community-based adaptation techniques, Rwanda trains local farmer groups in climate-resilient practices. This kind of community-led initiative strengthens social cohesion and offers sustainable responses against the impacts of climate.

Global Perspectives and Future Directions
Need for Policy Integration

Immediate actions need to be taken to integrate climate change adaptation and mitigation into agricultural policies. Incentives toward sustainable practices among family farmers, coupled with suitable financial support by their governments. According to the research title: ***"The Importance of Agricultural Development Projects: A Focus on Sustenance and Employment Creation in Kenya, Malawi, Namibia, Rwanda, and Uganda"***, the journal of Agriculture, chemistry, and Environment said The success of the sector means that people will have sufficient food, jobs will be created, and standards of living will be improved. The different projects implemented by local governments in the 5 countries and by the development partners have attained plausible results in providing job opportunities, increasing yield, providing food security, and creating a market for small-holder farmers. Despite these remarkable achievements, the agriculture sector in Africa as a whole is faced with many challenges that hinder its success, such as lack of funding, lack of infrastructure, limited land for farming, and climate change. To overcome these challenges and enable the sector to transform, bold policies need to be implemented. Sustainable Intensification in African Agriculture. International Journal of Agricultural Sustainability. (Pretty,J., Toulmin,C.,& Williams,S, 2011)

Technological Innovation and Education

In this regard, because of climate change, innovation in agricultural technologies will play a key role in the future of family farming. Precision farming is gaining greater importance, along with other digital tools and mobile-based information systems. (Pretty, 2011). More than 1 billion was invested in technology innovation and education according to United Nations Framework Convention for Climate Change (UNFCCC).

The Global Environment Facility (GEF) and the Green Climate Fund (GCF) provide financial support to developing countries to develop and deploy climate technologies. Since 1991, the GEF has supported developing countries to implement more than 800 projects with mitigation technology tran-

sfer objectives through over USD 5 billion of funding and USD 40 billion of co-financing. Since 2001, the GEF has also supported adaptation technology transfer through the Least Development Countries Fund and the special climate change fund. These two funds have provided more than USD 1 billion for over 300 projects with adaptation technology transfer objectives. Since 2009, the GEF has supported climate technology activities under the Poznan strategic program. Initially established with a budget of USD 50 million, this program aims to scale up the level of investment for technology transfer and thus help developing countries address their needs for climate technologies. The GCF, which started dispersing funding in 2015, will play a key role in supporting climate technology development and transfer in the future. To speed up climate action, countries are now working to enhance linkages between the UNFCCC Financial Mechanism and Technology Mechanism. (changes U. N.)

Building Resilience through Partnerships
Global partnerships between governments, the private sector, NGOs, and international organizations are necessary to help build the resilience of family farmers. Oxfam has financed the building of resilience. The partnerships should aim at financial support, capacity building, and knowledge transfer. Partnerships are at the core of Oxfam's work to bring about sustainable and transformative change. Oxfam is working in partnership with governments, civil society, and the private sector to build the resilience of poor women and men in the Asia-Pacific region. Investment in these partnerships delivers a positive impact, ensuring locally relevant and innovative approaches to resilient development. Partnerships are most effective when they are grounded in a shared understanding of resilience, and future programs should invest more in strengthening the long-term capacity of local partners to advocate for change at the national level. (OXFAM, April 2018)

Conclusion

Family farming in Rwanda is a double-edged sword in the context of climate change. On one hand, it faces significant vulnerabilities due to the impacts of climate variability; on the other, it offers promising pathways for mitigation and adaptation through sustainable practices. By embracing agroecology, enhancing water management, and promoting education, family farmers can not only safeguard their livelihoods but also contribute to global efforts against climate change. The future of family farming lies in recognizing its potential to be a key player in creating sustainable agricultural systems that benefit both local communities and the planet. Family farming is a cornerstone in both mitigating and adapting to climate change. This Rwandan case stipulates how small-scale farmers could lead the development of climate-resilient agriculture, though challenges will have to relate to finance, knowledge dissemination, and technology access. Family farming can play also a leading role at the global level and in Rwanda in the fight against climate change if appropriate policies and financial support are adopted. Resilience in family farmers needs to be invested in now: it is a matter of food security and sustainable development, in the face of the challenge that climate represents.

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The EU Climate Regulation do no harm to the EU Green Deal

Abstract:

This paper attempts to explore whether the **European Union (EU) climate regulations** undermine the **EU Green Deal**, particularly in achieving carbon neutrality by 2050.

The paper examines the latest data on the EU regulations, assessing it against the geopolitical dynamics and analyzing its provisions that include the EU climate law, the EU Emissions Trading Systems EU ETS, the Carbon Border Adjustment mechanism CBAM, Effort Sharing Regulation ESR, Renewable Energy Directive, Land Use, Land Use Change and Forestry LULUCF and Energy Efficiency directive, in relation to the EU Green Deal. It assesses their impact on the economic, social, political spheres within the EU member states and in global markets. It looks at how the regulations impact on climate policies outside the EU, with a focus on Kenya's climate action strategies.

Kenya is a major EU trade partner, and the EU Green deal has had a ripple effect on its national climate action plan whose target is to reach net zero emissions by 2050. The European Union backed climate financing and regulatory frameworks have shaped Kenya's policies and economic sectors that are dependent on the EU market.

The paper examines literature, policy reports, primary data to contextualize the nexus of the EU climate policies and global climate laws, focusing on the pathways by Kenya to align the Green Deal with sustainable development in Kenya and identifying potential challenges to these efforts.

Keywords:

EU Climate Regulation, EU Green Deal Net Zero Carbon Border Adjustment Mechanism Renewable Energy, Effort Sharing Regulation, Energy Efficiency, Emissions Trading System Kenya Climate Action Geopolitics Climate Diplomacy.

The findings show that the EU climate regulations have enabled the EU to step up its domestic commitments as it accelerates its adoption of the objective of climate neutrality by 2050. They also show that despite the regulations deemed to be Eurocentric, they have contributed a great deal to climate policies outside the EU leading in climate diplomacy.

Key Words: EU Climate Regulation EU Green Deal Net Zero Carbon Border Adjustment Mechanism Renewable Energy, Effort Sharing Regulation, Energy Efficiency, Emissions Trading System Kenya Climate Action Geopolitics Climate Diplomacy.

Acknowledgment

I express my deepest gratitude to my supervisor, Professor Sabahudin Hadzialic for the guidance, sacrifice, patience in guiding me to the conclusion of this program. I also thank Professors Ahmed Kandil,Kevin Burden, Vanni Resta,Mauro Buonocore, Stephano Liberti, Michelle Lapini and all the other who took their time to impart skills, knowledge, and information that build my capacity and understanding on reporting climate change.

I am grateful to the Universta` Telematica Internazionale -Uninettuno for providing the resources, funding that enabled me to undertake this program under full sponsorship. For designing the program and choosing topics and tutors who provided great insights into how to report climate change.

Thanks too to Daniele Bagnol for the technical support.

I dedicate this work to all the children of the world who look to us to protect the planet for their better tomorrow.

Introduction

The European Green Deal is aimed at positioning Europe as the global leader in climate action.

Launched in December 2019 under European Commission President Ursula Von der Leyen it seeks to transform the EU into a modern resource efficient competitive eco-friendly economy, reducing Green House Gas Emissions GHG leading Europe to net zero levels (EC.2022a)

European Commission (2019) ***"The European Green Deal sets out how to make Europe the first climate neutral continent by 2050, boosting the economy, improving people's health and quality of life, caring for nature, and leaving no one behind".***

The landmark deal has policies designed to curb emissions, enhance transition, and promote sustainable development.

The climate regulations that give effect to the green deal have however invited criticism from quarters who argue that it threatens economic and trade relations especially for developing countries.

But do the regulations harm the Green Deal, within member countries and in non-EU countries?
A number of theoretical frameworks that examine environmental policy, trade and development will set the basis of discussion.

Global Governance Theory suggests that collective action (global and multilateral) is the engine of climate change. It therefore argues that collective initiatives foster cooperation among states (Biermann,2007).

The study will examine the interconnection of the EU regulations and its potential for global cooperation.

Environmental Modernization Theory (EMT) posits that environmental sustainability hinged on technological innovation and market-based mechanisms is achievable even in the face of economic growth. A good example is the EU Emissions Trading System and the Carbon Border Adjustment Mechanism (CBAM) (Hoffman,2005). These regulations support green innovation helping reduce emissions without derailing economic growth.

The political economy of climate change on the other hand dissects how political and economic interests' impact on climate regulations mainly in global trade and in development (Bernstein,2001).

The paper will analyze whether the regulations create economic challenges for developing countries like Kenya or if they trigger strategies for sustainable development through trade and technology transfer.

The sustainable development theory supports the fusion of the environment, social and economic goals (Brundtland,1987). This theory will anchor the analysis of the EU Green Deal's climate regulations vis a vis sustainable development.

These theoretical frameworks will guide this paper's discussion on why the EU climate regulations do no harm to the EU Green Deal.

Literature Review

The European Green deal is deemed the blueprint that will guide the European Union EU to carbon neutrality by half the century. It provides pathways designed to transform the EU into a sustainable, climate neutral model in half a century (Resta V 2024).

The deal envisions what EU should be in coming decades providing a broad roadmap segmented into:
1. Biodiversity and Forestry
2. Agriculture and Food
3. Green Cities and circular economy.

Prior to its launch, 2019 was characterized by climate catastrophes that shook the world. Argentina and Uruguay started the year battling floods, then came storm Eberhard in Europe in March, and Cyclone Idai in Southeast Africa that left a trail of destruction, claiming lives in its wake. Further in America wildfires ravaged California through October and November razing billions worth of investments.

The European Green Deal EGD Vice President France Timmermans described 2019 a time of climate and environment emergency (Blondeel, M ,2024) In July 2021, the EU updated the green deal known as "Fit for 55" in reference to the 55 per cent reduction by 2030 compared to 1990 levels. The updated proposals were targeted at regulating shipping to cap emissions on maritime transport (Erbach G & Jensen L 2024).

In 2023, the climate crisis intensified, and Europe witnessed the largest war in Europe since World War II pitting Ukraine and Russia. There was also a growing geopolitical and economic tension between the United States of America and China in a scenario described as the age of volatility.

Antonio Gramsci captured this well in his words ***"an old world is dying and a new world struggle to be born now is the time for monsters."***

The European Green deal thus gave impetus to Europe's long term political and economic project, shaping its response to crises and challenges associated with emerging challenges and the new geopolitical reality. The deal has become the tool to help steer the EU through raging storms.

At the center of the green deal are the EU Climate Regulations that set ambitious targets towards net zero. These regulations do not only target to reduce emissions within the EU but seek to promote climate responsibility around the world. They complement the objectives of the Green Deal in relation to economic growth, environmental sustainability, and global climate leadership. Concerns on the potential economic and social consequences of the climate regulations have arisen outside the EU. The economic costs involved in transition to a green economy are enormous for developing countries and impact on sectors that rely on fossil fuels (Gupta & Mander,2020).

Adapting to the EU climate regulations which are deemed stringent have the potential of entrenching inequities existing between developed and developing nations (Adenle et al., 2022).

This paper analyzes the effectiveness of the EU Climate regulations on the EU Green Deal. It will seek to establish if the regulations have an influence outside the EU, specifically Kenya.

A review of literature, policy documents, data, primary data on climate strategies of the EU and Kenya will help contextualize the geopolitical implications of the EU regulations in global climate governance.

EU Climate Law and the European Green Deal

The European Green Deal EGD is a broad roadmap to net zero while the climate regulations are the specific initiatives that guide their implementation towards achieving the climate goal.

It outlines initiatives such as:

1. Reducing carbon emissions by 55 pc by 2030
2. Transitioning to a circular economy
3. Investing in renewable energy

The EU Climate regulations provide a framework to actualize the European Green Deal.

It sets clear pathway towards carbon neutrality through all polices in a socially fair and cost- efficient outlining the pathways with binding requirements for member states (2024)

Emissions Trading System (EU ETS)

It is a key tool to reduce carbon emissions through carbon trading without harming economic growth. Studies show that the EU ETS has enabled the EU to remain competitive in the global market that is increasingly focused on sustainability, (Schneider & Schrattenholzer, 2020). Companies receive or buy emissions allowances; each allowance permits a certain number of emissions. Organizations then can trade emission rights within the limits awarded (European Commission,2022).
This trading system places a price on carbon, incentivizing industries to innovate and reduce their carbon footprint. This aligns with the green deals goal of decarbonizing key sectors (EN 2023).

Critics argue that this regulation pose a financial burden on businesses in member countries of the EU and affects developing counties that rely on carbon intensive industries (Teytelboym et al., 2020). However according to the European Environment Agency (EEA), the strategy is working having realized 43 per cent reduction in emissions (EEA,2022).

Industries have been forced to embrace cleaner practices aligning with the Green Deal's goal of limiting global warming to 1.5 degrees (European Commission 2022).

Carbon Border Adjustment Mechanism

This prevents firms from avoiding emission rules, reshaping trade relations ensuring non-EU countries meet carbon reduction standards to maintain access to the EU market (Baffes et al., 2021). It encourages EU trading partners to adopt more sustainable practices, preventing carbon leakage helps reduce emissions globally while providing a level playing field for business (World Bank, 2021). Imported goods from countries with less stringent climate policies attract carbon tariffs. There are fears that developing countries may face hurdles due to challenges in accessing clean energy sources and limited industrial capacity, subjecting them to an economic burden (Adenle et al.2022). But (Lecocq et al. 2021) puts a strong defense of the regulations in a report that shows that these offer new opportunities for green technology transfer, financing, and capacity building. The EU signed a partnership agreement the Economic Partnership Agreement EPA with Kenya on Dec 18th, 2023, that aims to promote an inclusive green transition that focuses on digital, climate, energy and transport areas that are smart, clean from both the public and private sectors (Onyango & Njani,N., 2024). The EU Green deal thus makes EU a global climate leader in climate governance (Biermann et al. 2020). Kenya is a beneficiary of billions of euros to hasten development in renewable energy, sustainable agriculture, green hydrogen, and conservation (2023).

Effort Sharing Regulation ESR

The effort sharing regulation determines the annual emission allocation and how to evaluate progress. An analysis of the green deal by (Oxfam 2021) show that the regulations provide an opportunity for international cooperation on tackling climate change. The Italian Government will be drawing 3 billion from the 5.5 billion Euro National Climate Fund to support Kenyas climate goals aimed at curbing emissions. The deal will have Italy support it build climate resilience from the 5.5 billion Euro Mattei Plan (2024). The 'Fit for 55' package of July 2021 amended the ESR to set a gradual trajectory towards climate neutrality by 2050 thus a pillar of the EGD (Sweden.eu,2023).

Renewable Energy Directive

Member states are expected increase their share of renewable energy sources in the EU's total energy to 42.5 per cent by 2030. Sources should be from solar, wind power, hydrogen, geothermal and others from free and infinite natural resources.

This is a driver to innovation and technology transfer. (Flues and Lanza 2021) study show that this directive together with carbon pricing are catalysts for innovation of clean energy solutions. Residential areas in Nairobi Kenya are embracing the circular economy model in

the EU climate laws, in a cradle-cradle arrangement. The Alliance of Nairobi Metro Residents Association ANMRA leading several initiatives towards net zero (2024). Nyayo Estate located in the eastern parts of Nairobi in Embakasi, the model has seen a circularity of over 56,000 kilos of plastics recycled creating jobs, and spurring innovation on reuse and collecting 7000kg of e-waste (Obiero, T. 2024).

Figure 1

Nyayo Estate Residents Association Chairman receives the Circularity Award.

Source Circular Economy Conference and Awards 2024 Nov 14th

Figure 3

Close up of labelled cages for sorting recyclable and non-recyclable materials in Nyayo Estate Nairobi

(Source: Alliance of Nairobi Metro Residents Association, ANMRA Nyayo Estate Embakasi, Nairobi, 2020)

Figure 2

Community Engagement in using waste sorting cages in a residential estate in Nairobi.

Source: Alliance of Nairobi Metro Residents Association ANMRA,2023

While figure 1 and 2 demonstrate community efforts of circular economy, an indicator of societal acceptance and consciousness on sustainability, figure 3 shows the cages that facilitate sorting of waste to enable recycling within an urban setting a physical manifestation of the environment modernization theory.

Land Use, Land Use Change and Forestry

Focuses on enhancing carbon sequestration (removal of CO2 from the atmosphere) through carbon sinks. The passage of the Nature Restoration Law sets binding targets to restore degraded ecosystems with attention to those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters (2024).

Energy Efficiency Directive

This targets a 32.5 percent improvement in energy efficiency by 2030. To achieve EU 2030 climate energy targets and goals of the Green deal, sustainable economic activities under taxonomy and helping companies become more climate friendly are critical (Resta,V 2024). It seeks to facilitate job creation in the green economy and promote innovations in energy efficiency (UNEP 2021). The EU taxonomy allows financial and non-financial companies to share a common definition of economic activities that can be considered environmentally sustainable (2023).

Data

There is a notable increase in investments in Green Technologies and Innovation. The EU's Innovation Fund is supporting development of low carbon technologies committing 10 billion Euros towards these ventures. Over 200 projects in renewable energy, carbon capture and hydrogen were initiated under the fund in 2023 (Innovation Fund,2023). The EU climate regulations are linked to the steady growth of sustainable solutions with a 37 per cent increase in green technology patents (EPO,2022). Reports show renewable energy increased about 1.5 million jobs in the EU between 2015 and 2022 (Eurostat 2022). The growth in GDP from the Green economy investments is estimated to increase the annual EU GDP by 1 per cent creating over 2 million more jobs in the clean energy sectors by 2030 (European Commission 2021) The EU is recording a 27 per cent reduction in natural gas imports that is enabled by energy efficiency measures and increased renewable energy production (Eurostat,2023).

IRENA (2022) report paints a picture of a smooth transition showing an increase in renewable energy capacity by 15 percent from 2020 to 2022. The EU Climate laws are shaping climate governance creating a world where there is rising consciousness to environment friendly production. The EU climate regulations demonstrate how good practices on climate resilience have an influence outside Europe.The Global Gateway initiative that will see the EU contribute 300 billion Euros towards climate financing is accelerating transition (European Commision,2022). In a detailed report published by Sustainable bus, the penetration of sustainable transport and sales of electric transport is picking up (2024).

European countries are leading in the shift to clean transport to the previous year.

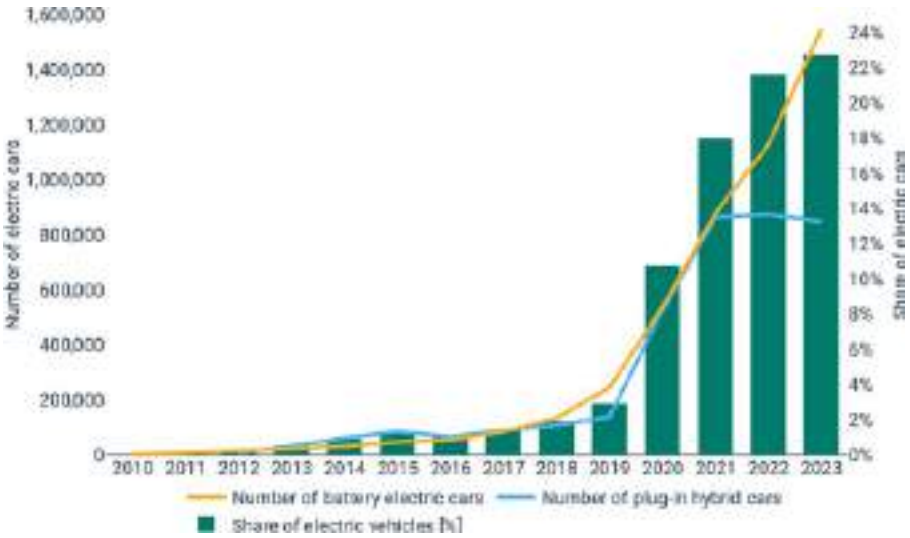
Year	Battery-Electric Bus Registration
2020	2,062
2021	3,282
2022	4,152
2023	6,354

Source Chatrou CME Solutions

Data by the European Environment Agency shows an increase in the upta-ke of electric carsand vans in all 27 EU member states with 2.4 million new electric cars registered in 2023a growth of new battery electric cars by 37 percent (EEA,2024).

The chart reports the number of newly registered electric cars (battery electric vehicles (BEV) and plug-in hybrid electric vehicles (PHEV)) in the EU-27.
- 'Share of electric cars' refers to electric car registrations (BEV and PHEV) as a percentage of new car registrations.- Non-plug-in electric cars, which are exclusively fuelled by conventional fuels, are not included in the data shown
Source: European Environment Agency EEA.

Data by the European Environment Agency shows an increase in the uptake of electric cars



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Source: European Environment Agency EEA 2024)

Source: European Environment Agency EEA

These developments in the European market triggered by the European Green Deal and enabled by the EU climate regulations have seen countries outside the EU who rely on car imports from these markets shift to clean transport.

Source:
NERA Chairman Teddy Obiero

Figure 4 A schedule of an electric bus plying the East Parts of Nairobi Kenya in partnership with the Nyayo Estate Residents Association NERA. Fleets have steadily increased since their introduction into the estate.

Kenya has adopted policies that seek to support the growth of clean transport (Moraa,N.

Kenya is enhancing its partnership with the EU to expand Europe's public and private investments in the green transition(Kenya,2024). These data point to a strong relation between the achievements under the EU Green Deal and the EU Climate Regulations.

Environmental Governance Theory

The data supports the argument that the EU Climate regulations are an enabler to the EU Green deal as it has facilitated governance structures that have enhanced sustainable development in the EU and outside the EU countries.

Climate Justice and Equity

The EU Climate regulations have pushed countries within the EU to formulate their own policies towards net zero by 2050.. The thrust of the 29th conference of the parties to the UN Framework on Climate change (COP29) in Baku Azerbaijan is to accelerate climate action through financing to support developing countries in reducing greenhouse gas emissions under a just transition program (UN,2024).

Economic Growth and Industrial Adaptation

There is increase in renewable energy, electric vehicle production and energy efficiency improvements. Regulations on the renewable energy directive, the EU ETS and Energy Efficiency are fostering new resilient pathways.

Reduction in Emissions

The regulatory mechanism in climate goals have facilitated smart investments increased demand for cleaner transport promoting a clean environment through reduced emissions (EEA, 2024)

Innovation

Legislation has incentivized waste management providing proper recycling and treatment. The legal certainty and stability have allowed recycling industries to strategize and manage investments in refining/recycling services. These developments would have been challenging to achieve in a free market condition. (EU,2024).
In Defence of the EU Climate Regulations

Although critics of the EU climate regulations claim that the regulations stifle innovation and are a threat to the economy, data examined tell a different story. The climate regulations are stimulating growth in green tech sectors like renewable energy, a sharp rise in electric vehicles, production of car batteries and other innovations. The regulations are enabling a uniform shift of countries towards sustainable and resilient growth.

Weakness

Data on the long-term impact on the economy from the implementation of the regulatory policies is limited. This thus makes it a challenge to assess the economic resilience and sustainability of the industries that are affected by the EU regulations. Therefore, we cannot say with certainty that the regulations will not impose a burden in the future for sectors that will be slow to adapt.

Conclusion

The climate regulations have provided a framework for sustainable economic growth, driven technological innovation, and created new markets for green technologies. The concerns raised in relation to its impact on the economy and trade pale against its approach to providing a conducive environment for global climate cooperation and development.

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Dealing with Environmental Crimes in Nigeria: A Case of the Niger Delta's Oil Theft

Abstract:

Environmental crimes are illegal activities that cause harm to the environment, impacting ecosystems, biodiversity, and human health. These crimes can range from illegal logging and wildlife trafficking to oil theft, illegal mining, and the dumping of hazardous waste. The concept of environmental crime remains largely ambiguous, but it is generally accepted as a category of criminal behaviour aimed at exploiting natural resources and polluting ecosystems for economic gain. The environment, once compromised by these crimes, suffers long-lasting damage that exacerbates climate change, disrupts ecosystems, and threatens local populations.

This paper examines environmental crimes in Nigeria, with a focus on the causes and impacts of oil theft in the Niger Delta region. The question arises: how can Nigeria address these environmental crimes effectively to reduce their long-term consequences and prevent future harm?

Keywords:

Environmental Crime, Niger Delta, Oil Theft, Natural Resources, Climate Change, Illegal Activities, Environment Management, Desalination Soil Degradation Irrigation Technologies Heat Stress

Introduction

With global awareness of climate change and environmental degradation increasing, the need to address environmental crimes has become more urgent than ever. They not only undermine climate conservation efforts but also threaten the livelihoods of communities dependent onnatural resources in the long run. The impact of environmental crimes goes far beyond immediate environmental damage. They exacerbate climate change by contributing to greenhouse gas emissions, particularly through deforestation and industrial pollution, leading to the loss of biodiversity and numerous species pushed to the brink of extinction. These crimes often affect marginalized communities and they frequently bear the brunt of pollution and habitat destruction, facing increased health risks and diminished economic opportunities. As natural resources dwindle, tensions can escalate, leading to conflict and further social injustice.

Nigeria is home to abundant natural resources but the nation faces significant challenges due to various reasons, including environmental crimes. These crimes include exploration and exploitation of oil, illegal logging, mining, waste dumping, disposal of industrial chemical wastes, burning and poor disposal of tyres, application of chemicals for fishing among others. These not only devastate local ecosystems but also have profound socio-economic implications for communities. The Niger Delta region, which holds the majority of the nation's oil reserves, has been subjected to oil theft (also known as oil bunkering), illegal mining, and pollution for decades. These activities not only destroy ecosystems but also hinder economic development, create social unrest, and exacerbate poverty in local ommunities. According to Bello(2017), Nigeria has been very active in the exploitation and exploration of oil and gas. It has been the major source of revenue which has contributed over 90% on yearly basis. There is no doubt that the Nigerian oil and gas industry is plagued with many impending problems. Clifford and Edwards (1998) are of the opinion that environmental crimes result in environmental harm but not all environmental harm result in environmental crime. Criminal syndicates tap into pipelines to syphon crude oil for sale on the black market. The environmental impact of this is staggering: spills result in the contamination of water bodies, destruction of mangroves, and loss of biodiversity. There are several laws, both old and new, on environmental and petroleum-related regulation in Nigeria as noted by Brown and Okogbule(2020) some of which include Oil Pipelines Act, Mineral Oils (Safety) Regulations (1963), Oil in Navigable Waters Act, Petroleum Act, Associated Gas Re-injection Act, the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act, the National Oil Spill Detection Response Agency (NOSDRA) Act,the National Policy on Environment 1989, Environmental Impact Assessment (EIA) Act and the Department of Petroleum Resources (DPR) - initiated Environmental Guidelines and Standard for the Petroleum Industry in Nigeria (EGASPIN) (2002). EGASPIN was revised first in 2016 and then 2018, which is the current version as stated by Ite (2013).

Oil Theft or Oil Bunkering

Oil theft as defined by Ayannioh (2013) is the process through which crude oil or refined petroleum products are illegally syphoned from pipelines and sold to interested dealers or buyers waiting on the high sea or other unscrupulous individuals. Asuni (2009) maintains that oil theft is an act of stealing crude oil from the pipelines or flow stations, as well as extra crude oil added to legitimate cargoes that are not accounted for. The reasons behind this crime are multifaceted, including widespread poverty, corruption, lack of government

accountability, and the allure of quick financial gains. Some other reasons are unemployment rate among youth in the region, criminal impunity in the country, neglect of the region by government and multinational companies, quest in sharing and taking part in national cake, weak prosecution process, youth restiveness and collaboration between the security agents and the bunkers as asserted by Assi, Amah and Edeke(2016).

Local communities, often marginalized and deprived of the benefits of oil wealth, may see involvement in oil theft as a means of survival. Consequently, for many years, residents of some Nigerian cities, particularly port harcourt have been battling severe soot pollution linked to the activities of illegal oil refineries. This situation has reduced the air quality, with soot covering roads, farmlands, and water bodies, infiltrating homes and offices, and causing severe health implications for residents. Indices of oil theft, pipeline vandalism account for the massive crude oil spillages and pollution in the region, destroying host communities farm lands, vegetation, destroying the people's means of livelihood and polluting the rivers because their main occupation in the region is farming and fishing. These communities suffer the challenges of the poor means of livelihood arising from the environmental pollution, and both the government and the multinational oil companies waste resources in an attempt to clean up the environment. Assi, Amah and Edeke(2016).

Furthermore, the Niger Delta's predicament is compounded by government corruption, a lack of enforcement of environmental laws, and economic inequality. The United Nations Global Programme against Corruption (GPAC) defines corruption as "abuse of power for private gain". Transparency International gives the definition of the term as "the abuse of entrusted power for private gain" ; it can also be defined as a perversion or change from the generally accepted rules or laws for selfish gain. Oil companies and the Nigerian state often fail to address the root causes of oil theft, leaving the local population to endure environmental degradation and social instability.

Green Criminology

Environmental crime theory draws from multiple disciplines, including criminology, environmental science, sociology, and political science. Several theoretical approaches explain the causes and consequences of environmental crimes, but for this work, a key perspective called Green Criminology will be used. Some scholars have expanded on green criminology by stating that environmental crimes are not merely a violation of laws but a broader violation of moral and ethical codes that protect the natural world. The Niger Delta's experience with oil theft fits this model perfectly, as it highlights how both the state and private corporations (oil companies) neglect their moral duty to protect the environment.

This approach focuses on the impact of the harms and crimes that are committed against the environment and its species, Ugwudike(2015). South (2014) defines green criminology as the study of crime, harm and injustice related to the environment and to species other than humans. Over the past few decades, awareness of the financial and human costs of environmental damage has increased and registered with some others who are not environmentally green as opined by South (2014). Green criminology challenges traditional criminological theories, arguing that environmental crimes are not just violations of environmental regulations but crimes against the planet and its inhabitants. According to green criminology, environmental crimes are often perpetuated by powerful corporations and governments, which exploit legal loopholes, corruption, and weak enforcement to further their interests.

Statement of Argument

This research asserts that oil theft is the biggest environmental crime in Nigeria, with its devastating ecological consequences, socio-economic impacts, and entrenched political dynamics. While there are various forms of environmental crime in Nigeria—such as illegal logging, artisanal mining, and hazardous waste dumping—oil theft, particularly in the Niger Delta, stands out as the most significant. This is based on the scale of damage oil theft causes, its entanglement with corruption and weak governance, and its long-term implications for both the environment, local and global communities. The repercussions of oil theft extend beyond environmental degradation. They contribute to ongoing conflicts in the region, social unrest, and economic instability. Therefore, addressing oil theft is crucial not just for environmental protection, but for the overall well-being and development of Nigeria, the giant of Africa. Addressing this menace requires a multi-faceted strategy. While security measures to protect oil facilities and pipelines are necessary, these must be complemented by structural reforms aimed at reducing poverty, empowering local communities, and improving governance. Without addressing the root causes of oil theft, Nigeria's efforts to curb environmental crimes will remain insufficient.

Causes of Oil Theft

A major perspective is that oil theft in Nigeria is driven by poverty and lack of economic opportunities in the Niger Delta region. In this context, illegal oil extraction is seen as a survival mechanism for many local communities. Ikelegbe (2005) and Obi (2010) note that oil bunkering is a key activity of militant youths in the Niger Delta, who launch attacks against the government of Nigeria and Multinational Corporations (MNCs) in their fight for resource control. According to Ezirim (2011), Niger Delta militant youths are now known for economic and financial criminal activities including pipeline vandalization, piracy, oil bunkering, small arms proliferation, hostage- taking and kidnapping. Omoyibo (2013) argues that poverty is a general condition of deprivation of needs, social inferiority, isolation, physical weakness, vulnerability, powerlessness and economic inequality in the state, and these are prevalent in the Niger Delta region. Also, Wilson (2014) opines that unemployed youths among whom are the disengaged staff of the oil multinationals with technical knowledge on how to manipulate the oil facilities, resort to pipeline vandalisation and oil theft as a means of engaging themselves economically and providing means of livelihood. This heightens the oil theft activities in the region. With few alternatives for livelihood, residents turn to illicit oil bunkering, a lucrative yet destructive activity. This perspective emphasizes the need for economic empowerment programs to alleviate poverty and reduce the dependency on illegal activities. Another important perspective is the role of corruption in enabling environmental crimes. Some Nigerian political elites and corrupt officials, from local to national levels, facilitate oil theft by looking the other way or directly benefiting from it. The relationship between local criminal syndicates and government officials creates a permissive environment for environmental crimes to thrive.

Impact of Oil Theft

According to Wilson (2014), some people benefit from the activities and proceeds of the oil theft in the region, including the actors and non - actors, but many others (including individuals and the state) suffer losses from the oil theft. Both the actors and non-actors losetheir lives and properties worth billions of naira to oil theft activities, either during a gun battle between the host

community youths, militants and state security agents while syphoning the crude oil from the oil pipelines and well heads, or in a fire disaster during the local refinery work by the local oil criminals.

Environmental Degradation

From an environmental perspective, oil theft leads to severe ecological degradation. Spilled oil poisons water sources, destroys soil fertility, and disrupts the livelihoods of local communities. According to Ogbuagu (2016), it has been reported that petroleum refining contributes solid, liquid, and gaseous wastes to the environment. Some of these wastes could contain toxic components such as the Polynuclear Aromatic Hydrocarbons (PAHs), which have been reported to be the real contaminants of oil and most abundant of the main hydrocarbons found in the crude oil mixture.

Oil pollution in the Niger Delta has caused the destruction of mangrove forests, biodiversity loss, and the contamination of fishing grounds. The health impacts on local populations are equally dire, with an increase in respiratory problems, skin diseases, and cancer. These environmental and health effects disproportionately affect the poorest members of society, exacerbating the social inequality already present in the region. Nriagu et al (2016) conducted a survey with 600 participants to ascertain pathological and psychological impacts of oil pollution on residents of local government areas in Akwa Ibom state.

According to this survey, most participants lived in areas with visible oil pollution and near gas flaring facilities. They also regularly suffered direct exposure to oil in their environment.
High levels of emotional distress was a part of their lives and risk perception in the study area was mediated, to a large extent, by dreaded hazards (catastrophic fears of pipeline explosions and oil spill fire), visual cues (gas flares and smoke stacks) and chemosensory cues (off-flavor in drinking water). The exposure metrics were found to be significant predictors of the health effects and influencing factors (emotional reactions). Nriagu et al (2016) opine that there is a need for some intervention to ameliorate the psychological distress associated with living under such environmental adversity. Oil theft not only contributes to a “toxic legacy,” poisoning the land and water, further perpetuating the cycle of environmental degradation and poverty, it is also a health hazard.

Other Implications of Oil Theft

On the global level, environmental crimes in Nigeria contribute to a reduction in government revenue, regional insecurity as well as climate change through the release of harmful greenhouse gases and the destruction of vital carbon sinks like forests and mangroves. Soremi (2019) highlights the interconnection of Nigeria’s economy and oil, noting that the country is heavily dependent on sale of crude oil, such that 80% of federal government’s revenue, 95% of export receipts and 90% of foreign exchange earnings come from oil exports. Also, based on the system of fiscal federalism operational in the country, the federal government distributes the returns from oil exports to the other layers of government i.e. the state and local governments, and these allocations account for 82% of the funds available to them. According to Irina (2016), at the national level, oil theft has made Nigeria to lose nothing less than an estimated 400,000 barrels of crude everyday which has cost the country an estimate of about $1.5 billion (US dollars) or N12.7 billion every month. A recent report by Thisday Newspaper (2024) shows that in the first

five months of 2024, Nigeria may have lost as much as $3.57 billion to oil theft and pipeline vandalism.

Rita-Igboanugo (2021) notes that the role of oil spillage from oil theft has drawn little attention over the years. This is because the evidence of oil spill impact on climate change may not widely be visible or directly evident. Nevertheless, oil spill contribution to climate change can occur via anthropogenic activities or chemical processes. Environmentalists warn that governments need to find a sustainable way of handling looted oil rather than outright burning, due to the grave risks that burning oil boats together with the oil contents pose to the environment and human health, as reported by Babatunde(2023).

Conclusion

Environmental crimes in Nigeria, particularly oil theft, are deeply intertwined with economic, social, and political factors. Addressing it requires a multi-faceted approach that combines stricter enforcement of environmental regulations, community engagement, and initiatives aimed at poverty alleviation. Raising public awareness and fostering community engagement can also empower individuals to advocate for change and hold perpetrators accountable. Without addressing the root causes of poverty and unemployment in the Niger Delta, efforts to reduce oil theft will remain ineffective. Dealing with oil theft in Nigeria also requires an enhanced security around pipelines and oil facilities. This can involve the deployment of advanced surveillance technology, increased patrolling, and collaboration with local communities to identify suspicious activities.

Empowering local communities is very crucial. Development programmes that provide alternative livelihoods can reduce dependence on oil theft. Initiatives could include vocational training, support for small businesses, and investments in agriculture and other sustainable industries. When communities see tangible benefits from legal economic activities, the incentive to engage in illegal activities diminishes.

Reforming laws and policies related to the oil sector can enhance regulation and enforcement. Establishing stricter penalties for oil theft and related crimes will more often than not, serve as a deterrent. By addressing the root causes and implementing a multi-faceted strategy, Nigeria can make significant progress in combating oil theft, protecting its environment, and promoting sustainable development.

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Sector of Economy Impacted by Climate Change (Case of Kenya – Africa)

Abstract:

Climate change has disrupted the socio-economic development in Kenya, manifested through the concurrent flooding, drought seasons, and the erratic rainfall patterns and temperature variation, (Mwambire, T., Joseph, E. 2020). These effects have significantly affected the country's key economic pillars such as agriculture, water, energy, tourism, and wildlife sectors. Others are housing, health, transport, business, mining and industrial sectors which are mainly climate-sensitive. Prolonged droughts, frost, hailstorms, extreme flooding, receding lakes level, and drying of rivers are common extreme weather events impacting livelihoods. Kenya like many other African nations is vulnerable to consequences of climate change, both direct and indirectly with heightened susceptibility to droughts and floods.

The severities of the effects are due to the Kenya's overreliance on rain-fed agriculture exposing the country to food and nutrition insecurity. The Institute of Economic Affairs (IEA) estimates that the Kenyan economy is set to lose about 8.0% of Gross Domestic Product (GDP) every five years due to the impacts of droughts and about 5.5% of GDP every seven years due to the impacts and floods and it is expected to have an adverse impact in the coming years if no action is taken to mitigate and adapt to future climate change events. . The agricultural sector which is disproportionately susceptible to the climatic hazards, accounts for approx 34% of Kenya's GDP (KNBS, 2019), 65% of exports and over 60% of employment in rural areas (KNBS, 2016), implying shocks to the sector can have severe impacts on the households and the overall economy.

Keywords:

Socio-economic development, environmental degradation, temperature variation, socioeconomic activities, anthropogenic activities, deforestation, key economic pillars.

The 3 aims of this study were to:

1. Examine the socioeconomic impacts of climate change in Kenya,
2. Identify key challenges facing climate change mitigation and adaptation in the country and...
3. Analyses how climate change has hindered major socio-economic development at the grassroots level.

The theoretical analysis of the study is based on the assumption that countries, individuals and even organizations will act for the greater good of society by protecting the ecosystem. This is aimed at supporting the government's efforts to educate the public on the importance of protecting the environment and implementing effective environmental policies. The qualitative results revealed that almost all sectors of Kenya's socio-economic development are significantly influenced by climatic conditions, threatening the growth and development of the nation.

Anthropogenic activities like destruction of water catchment areas, poor farming patterns, deforestation and emission of Greenhouse Gases (GHG) through combustion of fossil fuel are the key contributors to climate change menace. The key findings show that Kenya's socio- economic development is greatly affected by changes in climatic conditions, as demonstrated by its heavy reliance on rain-fed farming, which serves as the primary driver of the country's economy. Additionally, the findings revealed that there is minimal or no public knowledge about climate change adaptation, hence the persistent environmental degradation behaviors. This is primarily due to the government's passive approach to climate change mitigation and adaptation, as well as the absence of a proactive institution to spearhead these efforts.

Organizations and environment stakeholders, both locally, regionally and globally, should actively engage in promoting climate change adaptation and mitigation.integrates social, economic, and political dimensions to capture the full spectrum of climate impacts on Zambian communities. Third, it emphasizes the importance of investing in journalist training programs focused on climate issues to build capacity and foster motivation among media professionals.

Finally, the study highlights the necessity of embedding climate change topics within journalism education curricula, equipping future journalists with the skills and knowledge required for impactful reporting on environmental challenges.

Through these recommendations, the article underscores the pivotal role that Zambian media could play in elevating climate discourse, promoting informed public dialogue, and galvanizing collective action toward climate resilience. By enhancing climate change reporting, media outlets have the potential to drive societal engagement and inspire proactive measures to mitigate and **adapt to climate impacts, ultimately contributing to a more sustainable and resilient Zambia.**

Introduction

With predicted increase in climate change, the frequency and severity of droughts and floods are projected to rise significantly (Shiferaw, et al., 2014). These dynamics require building effective coping mechanisms by government and private sector to mitigate potential losses that stifle developmental outcomes. In the recent years, Kenya has experienced increased frequency of extreme weather events ranging from prolonged droughts (La Nina) and intense rainfall (El Niño), frequent and devastating floods especially in the low lying lakeside and coastal regions.

According to the Kenya National Disaster Operations Centre (NDOC) an estimated 315 people were killed, 188 injured, and 38 reported missing, while more than 293,200 people (58,641 families) have been displaced and nearly 306,520 (61,304 families) were affected by heavy rains and floods between March 1 and June 18, 2024. Subsequently, Kenya Red Cross Society (KRCS) reports that at least 9,973 livestock died, 41,562 acres of cropland destroyed due to the catastrophic floods as at June 2024. Meanwhile, the National Drought Management Authority (NDMA) through the Long Rains Season Assessment Report, 2023 showed that approximately
2.6 million livestock estimated to be worth USD1.7 million (KSh226 billion) died due to prolonged drought experienced in the Arid and Semi-Arid Lands (ASALs) counties of Kenya by December 2022. These climatic risks are estimated to have cost at least 14% of Kenya's GDP each year significantly affecting sustainable development.

Further, major drought witnessed in 1998-2000, 2004/05, 2009, 2011 and 2020 and devastating floods that occurred in 1997/98, 2006, 2010 and 2023/24 impacted negatively on the socio- economy developments in Kenya. The Stockholm Environment Institute report (2009) on 'The economic costs of climate change in Kenya' revealed that the economic costs brought about by drought in the period of 1998-2000 cost the country an estimated $2.8 billion due to losses of crops, livestock, forest fire, damage to fisheries, reduced hydro-power generation, reduced industrial supply and reduced water supply, affecting key sectors. Subsequent drought events witnessed in 2004, 2005 and the recent 2009 affected millions of people leading to restrictions on water and energy. The 1997/98 floods affected almost 1 million people and had an estimated total economic costs of $0.8 to $1.2 billion arising from damage to infrastructure such as roads, buildings and communication apparatus, effects on public health like water borne diseases and fatalities and loss of crops.

The National Climate Change Response Strategy, 2010, recognized the impact of climate-driven changes on Kenya's socio-economic development. The National Climate Change Action Plan (NCCAP) III 2023-2027 outlines priority actions that Kenya will embark on to address climate change in the medium-term setting out both adaptation and mitigation contribution intended to abate greenhouse gas emissions by 32% by 2030 reducing vulnerability to climate change and therefore improving the country's ability to take advantage of opportunities that climate change offers (Kramer, et al. 2023).

The socio-economic development, guided by Kenya Vision 2030, aims to transform the country into an industrializing, middle-income nation that provides a high quality of life to all its citizens in a clean and secure environment by 2030. This can only be achieved if the action addresses sustainable socio-economic development with a strong emphasis on climate change.

Kenya is dependent on rain fed agriculture and as such a shift in the normal distribution of the weather patterns implies a major cost implication which has a tremendous effect on the socio- economic development of the country. The country can overcome the challenges of weather related hindrance by adapting to both rain fed and irrigation agriculture. Government and non state organizations are championing initiatives on climate smart agriculture, soil and water conservation, rain water harvesting, and use of drought resistant crops to adapt to the posed challenges.

The national government launched the landscape restoration initiative targeting to grow at least 15 billion trees by 2032 in an effort to reducing greenhouse emissions, stopping and reversing deforestation and, restoring 5.1 million hectares of deforested and degraded landscapes across the country.

Kenyan farmers have noticed a change in temperature and rainfall patterns and in response to the observed changes, many farmers have adapted in various ways to cope with the effects of climate change. Some farmers are changing their crop sowing dates to evade expected high temperatures, while others started planting heat-tolerant varieties.

Regarding decreased rainfall, farmers recognized the use of high-water-efficient varieties and/or early maturing varieties as effective ways to cope with rainfall shortage. Others use underground or drainage water for irrigation and improved drainage as alternative methods for coping with changes in rainfall pattern.

Kenyans are banking on these adaptation and mitigation efforts to ensure the country improves on its socio-economic activities to ensure it produces to its capacity thereby adding to the food basket of the country across the year.

Global, Regional and National Policy Framework

The United Nations framework Convention on Climate Change (UNFCCC) lays the foundation for multilateral initiatives on curbing climate change. The UNFCCC key objectives are to stabilize GHG emissions and promoting sustainable development. The 4th Assessment Intergovernmental Panel on Climate Change (IPCC) report clearly highlights that the mixed effects of climate change is continental and the most affected countries are the developing nations, with Africa bearing the greatest risk because their economies rely more on climate sensitive activities.

Rapid population growth in Africa has exacerbated pressure on land leading to the depletion and constant extinction of tropical forests and rangelands. These effects have exposed Africa to loss of biodiversity, rapid deterioration in land cover and depletion of water catchment sources, impacting negatively on the socioeconomic developments of African countries including Kenya.

At the regional level the African Union Agenda 2063 calls for member countries to prioritize climate change adaptation and mitigation measures by leveraging technology, skills development, and to mobilize domestic resources to transform Africa into a resilient, robust economy capable of withstanding climate-induced hazards.

Kenya's modalities to curb climate change impacts

The Constitution of Kenya 2010, assigns the function of climate and disaster management policy development to both the national and county governmen-

ts. This way, the national government has a mandate of developing policies on ASALs regarding socio-economic development, special programmes and food relief management. It also establishes policies and guidelines that protect and manage environment and natural resources to foster socio-economic development.

The Kenya Vision 2030 provides the strategic direction in terms of development goals and policy priorities. It aims at reducing the impacts of disasters including losses resulting from droughts and floods. The Vision's priority flagship projects include development of national integrated drought early warning systems and integrated knowledge management system.

The National Drought Management Authority (NDMA) has implemented the Ending Drought Emergencies Common Programme Framework in 23 ASAL counties. The National Disaster Risk Management Policy aims to provide the framework for addressing a wide-range of disasters including those resulting from droughts and floods. Its objectives include strengthening institutional capacity for disaster risk management; reduced disaster risks vulnerabilities at county and national levels; mainstreaming of disaster risk management into policies across all sectors; enhanced resilience at national and county levels to the impacts of disaster risk and climate change; and enhanced coordination in disaster preparedness, prevention, response and recovery. Other national policies and legal framework include the Kenya National Adaption Plan 2015-2030 and the National Climate Change Action Plan 2018-2022. The National Climate Change Action Plan aims to enhance adaptation to climate change and reduce greenhouse gas emissions at national and county levels. It calls for a holistic climate change adaptation across all sectors of the economy in planning, budgeting and implementation. Other provisions of the Climate Change Act 2016 include the establishment of the Climate Change Fund for financing priority climate change actions and interventions; and establishment of the National Climate Change. Other institutions include the Kenya Meteorological Department mandated to provide access to meteorological information and services through collection and dissemination of meteorological information; and coordination of research in meteorology and climatology. Also, the Kenya Meat Commission facilitates livestock off take to minimize losses emanating from disasters particularly drought in ASAL areas.

Sectors Impacted by Climate Change in Kenya
Kenya has witnessed its share of climate-related hazards In recent years, significantly impacting on the socioeconomic activities. These climate-related impacts have ranged from prolonged droughts, frost in some of the productive agricultural hub, hailstorms, extreme flooding, receding lakes level impacting on the fishing industries, drying of rivers and other wetlands, leading to large socioeconomic losses impacting directly on the food security.

These extreme climate events have led to displacement of communities, resulting in conflict over natural resources, competition of scarce resources which has led to humanwildlife conflicts.

Rainfall is viable, having an annual cycle with two wet seasons; the long rains (Marchmay) contributing 70% of the annual rainfall and the short rains (OctoberDecember). The Western highlands and the coastal areas also receive rainfall during September –June. These complex patterns of climate variability brought about by factors such as El Nino and La Nina have huge effects on the country's key sectors including; agriculture, tourism, infrastructure, forestry, energy, health and water.

Agriculture sector

The agricultural sector (CBK, 2023) is the pillar of the Kenyan economy contributing directly 24% of the GDP with a total value of KSH342 billion, and another 27% indirectly valued at KSH385 billion, having 65% exports earnings. The sector accounts for 65% of informal employment in rural areas, and accounts for 80% of livelihoods and food security of the population. Kenya's main cash crop is maize, with other crops like cassava, sweet potatoes, millet, rice, wheat, sorghum, vegetables, and bananas also being grown in many parts of the country.

Kenya depends on the 16% high and medium agricultural potential land mass, with the remaining 84% being ASALs predominantly used for ranching, agro-pastoralism and game parks. Due to this, Kenya has laid down Agricultural Sector Development Strategy (ASDS) in its Vision 2030 covering the period from 2009-2020, aiming at positioning the sector in the lead to deliver a 7% annual growth rate that will boost the rest of the economy into two digits (10%) as envisioned under the economic pillar of Vision 2030. Despite these efforts, Kenya still grapples with food security challenges, brought about by over dependence on rain-fed agriculture for food production. The agriculture sector is very sensitive to climate change, therefore agriculture systems in Kenya need to adapt to the ever-changing climatic changes to ensure provision of adequate food for a growing population, while increasing export crop production to generate foreign earnings hence boosting the economy.

Agriculture in Kenya is a large sector and a growing GHG emitter, responsible for about 30% of Kenya's emissions. The IPCC has concluded that poorest countries would be hardest hit with effects of climate change on the agricultural sector, brought about by decreased water availability and increased GHG mainly attributed with lower adaptive capabilities. The changing rainfall patterns have affected the planting system hence affecting farmers who mainly depend on rain- fed agriculture. In some regions such as the Coastal parts of Kenya, the changing pattern of rainfall has affected the bi-annual planting system hence having implications on the countries food security. Climate-related impacts such as rising temperatures have led to increased evapotranspiration, resulting in reduced soil moisture hence affecting the soil moisture content.Rising temperatures have also led to greater destruction of crops and fruits trees by pests which

thrive best in hot temperatures thus reducing quality and reliability of agricultural yields. Kenya over the years has experienced socio-economic impacts of climate change brought about by environmental degradation due to urbanization, over-population, and adoption of modern technologies, dumping and deforestation which has impacted on the agriculture sector leading to food insecurity. Over ten million Kenyans suffer from chronic food insecurity and poor nutrition, and between two to four million people require emergency food assistance at any given time (Emongor, R.A. 2023).

Conclusions

Climate-induced hazards such as droughts and floods impose significant impacts on socio- economic development. These in turn have negative consequences such as poor health outcomes and poverty. Addressing the impacts of climate-induced shocks require a high level political goodwill and support to effectively eliminate the risks associated with climate change. For Kenya, adaptation to climate change remains the top priority to reduce vulnerability and enhance resilience of the socio-economic developments especially

for the vulnerable communities and groups within the country. The country should enhance mitigation actions that will deliver sustainable socio-economic development tailored at enhancing a national socio- economic development as set out in the Vision 2030 and still instill the virtue of low GHG emission in an aim of enhancing climate smart strategies by promoting use of clean energy technology for improved and sustainable livelihoods. Climate change stakeholders too should be encouraged to mainstream climate proofing and climate change responsive activities in their daily routine activities to enhance climate change awareness and preparedness in the face of future climate related catastrophe.

Therefore for climate change to be addressed effectively, a collected effort from the government, climate change stakeholders, public and private sectors stakeholders and the general public should be harmonized to enhance climate change mitigation and adaptation.

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Artificial Intelligence as a Threat to Climate Change or a Tool for Communicating the Truth: Media Literacy as the Key or the Lock

Abstract:

The relation between climate communication and the use of artificial intelligence has raised the serious debate on how AI can be used as a solution rather than a threat globally. This paper analyzed the dual role of an artificial intelligence in communication. The true and accurate stories and, on the other hand, how it is used to increase a rate of misinformation. When AI-generated information can accelerate the dissemination of climate-related fake news, misleading narratives, and denialist propaganda, they strongly negatively affect public understanding and climate action.

On the other hand, AI provides an opportunities to climate communicators, including journalists and media professionals, in enhancing reporting through data analytics to reach audiences more effectively with scientifically accurate information.

This article argues that robust media literacy is to be one of the critical skills in enabling people and societies in discriminating fact from misinformation. It argues that fostering media literacy would be important in leveraging AI for positive action on climate while mitigating its risks.

Keywords:

Climate change, Artificial Inteligent, mis-information, Threat, Accuracy, Truth, Communication, Media

Introduction

The deepest roots of climate change begin with the second industrial revolution and the widespread adoption of fossil fuel-based machinery. As the world enters the fourth industrial revolution, the adoption of advanced technologies such as artificial intelligence (AI) introduces complex challenges and opportunities for the nowinevitable and as-yet-undetermined issues of climate change (Rutenberg et al., 2021).

Technologies associated with the fourth industrial revolution (4IR) include blockchain,the Internet of things (IoT), artificial intelligence, cloud computing, quantum computing, advanced wireless communications, and 3D printing, among others, but AI hasprobably been postulated for longer than any other 4IR technology, but has remained impractical until the recent decade (Beduschi, 2021). Effective communication of climate change is hampered by the complexity of scientific data, public misinformation, and psychological distance from the issue. AI can enhance communication by personalizing messages, combating misinformation, and visualizing data in engaging ways. For instance, AI-driven data visualization tools can make complex climate models more understandable to the public, while AI algorithms can identify and counteract false information online (Rutenberg et al., 2021).

Combination of scientific complexity, misinformation, and psychological barriers are mainly the problems that hinder effectiveness of communication of climate change, whereby climate change involves intricate scientific data that can be challenging for the general public to understand. This complexity is often exacerbated by misinformation and politicization, which can lead to public confusion and scepticisms. Moreover, cognitive biases and psychological distance, where people perceive climate change as a distant, non-immediate threat, hinder effective communication (Stankovic et al., 2022).

Effectiveness of the countries of the European Union in using the latest technologies is associated with the need to implement national and Pan-European climate strategies (Cowls et al., 2023). The use of Artificial Intelligence (AI) for climate change communication in the European Union is increasingly gaining traction, reflecting a significant trend towards leveraging advanced technologies to enhance public awareness and engagement (Makhonko et al., 2021). AI-driven tools are being employed to analyse vast amounts of environmental data, predict climate patterns, and tailor communication strategies to diverse audiences, thereby making climate information more accessible and actionable (Makhonko et al., 2021). Countries like Germany, Italy, France, and the Netherlands are at the forefront, integrating AI into public policy frameworks and educational initiatives to foster a more informed and proactive citizenry. This trend aligns with the EU's broader agenda of digital transformation and sustainable development, emphasizing the role of AI in addressing complex global challenges (Kaack et al., 2022). For instance, projects funded under the EU's Horizon 2020 program exemplify the commitment to utilizing AI for environmental sustainability and climate resilience (Cowls et al., 2023).

Some countries in Africa are serious in adoption of AIF for climate predictions (Rutenberg et al., 2021). For example, Ethiopia launched its first observatory satellite into space in 2019. The 70-kg remote sensing satellite is to be used for agricultural, climate, mining and environmental observations, allowing the Horn of Africa to collect data and improve its ability to plan for changing weather patterns (Rutenberg et al., 2021). In nations like Kenya, Nigeria, and

South Africa, AI-powered tools and platforms are being developed to disseminate climate-related information, predict weather patterns, and engage communities in climate action (Gwagwa et al., 2021). For instance, AI applications are being used to analyse large datasets from satellite imagery and social media to track climate trends and inform policy decisions (Gwagwa et al., 2021). These technological advancements facilitate more accurate and timely communication, empowering local communities to better prepare for and respond to climate-related events (Leal Filho et al., 2022).

AI tools can be defined as a threat to Climate Communication if it cant be used in a good way. The uses of AI-generated content by the Journalists and Media houses is increasing daily, but how to use those AI tools to communicate complex topics like Climate change is still a big challenge facing Climate Communications. **But how are looking Climate in the threat perspective?**

1. Catalyst to Climate Misinformation
Mostly AI tools, for example on social media, always prioritize those contents that have more engagement. This means it can create a higher chance to amplify the distribution of misinformation to the public. As we all understand, the speed of social media is higher than even traditional media today; the chance to reach millions of people globally is big, and the effects as well will be higher. The end result of this is the confusion to the public and affecting urgent action toward climate adaptation and mitigations. (Lewandowsky, Ecker, & Cook, 2017).

2. Deepfake Technology
Modern AI technology in creating high-quality videos and images by using technology like Deepfake can be used to mislead people. A disinformation risk is higher than accuracy in the application of this AI tool, which also hinders and distorts the accuracy of the climate-related information. Most of the time, disinformation spreads faster than true information. The spread of this kind of false information undermines the
movements against climate effects and climate actions. (Chesney & Citron, 2019).

3. Human interest based Information
AI algorithms creates content depending on the interest of the users. A climate knowledge on adapatation and mitigation process is dynamic thing which always can change. Using AI to get Climate information can lead to access the same kind of information depends on the users experience, which may lead create a domant minded people on Climate actions. (Flaxman, Goel, & Rao, 2016).

4. Manipulation of information by Corporate Interest
Companies like those producing and Saling Oil they are in a high chance to use AI to manipulate Climate information for their bussiness interest. Manipulated data can be used to influence public, government, policy makers and climate activist to make wrong decisions or delay the action against effect of climate change. This also affect much climate communication process. (Oreskes & Conway, 2010).

5. Untrusted Climate report
AI can be used to produce information those are against scientific reports. These kind of information can erode the trust to climate science reports which will make more harder for climate communicators to adress urgent issues related to climate change.

Suprisingly, AI generated data has more information relation to the targeted audience that most of scientific datas. AI users they are at risk of getting and distributing wrong AI generated Climate information. (Wardle & Derakhshan, 2017).

Its understandable that, Climate as a global challenge needs to be communicated with full trust and higher avoidance of misinformation, which can undermine the effort to tackle the climate change problem. There is a fear among Climate stakeholders including scientist, researchers, Organisations and Policy makers on the growth of AI technology which may somehow affect the Climate communication and awareness efforts. Despite the fact that there higher chance for the AI to be used to dis and misinform the public about Climate related issues, but still there is hope on AI. Journalist and Climate Communicators they can use AI to promote the best and most trusted methods of climate adaptation and mitigation. To the global audience. And this is another pespective of Artificial Inteligent on Climate Communication;

AI as a tool to communicate truth and Accurate Information

We can ask ourselves, how can we leverage the use of artificial intelligence to communicate trusted climate informations? Here is where the debate is. But lets look first on the positive side of Artificial Intellingent in Climate communication globally, this includes the uses of the modern
and transformative methods in climate communication.

1. AI can be used to analyze several data points quickly without using many resources Analysis of data can simplify ways of telling climate stories since not every climate communicator has the capacity to make a good and accurate climate data analysis.

2. AI can be used in the weather prediction Before the introduction of AI was not possible for a Journalist to do a weather prediction assignment, this was a task given to only personnel with a geological knowledge and experience. But in an AI era the only required skills here is to understand the best way of using AI in getting correct and accurate weather predictions information.

3. Artificial intelligence systems, like algorithms that manage social media platforms, and even AI-created content changed the understanding of how people receive climate information

By providing an analysis of climate data, artificial intelligence can be used to tell the stories that can be easily understandable to the public. Nowadays we can experience most of the data generated by AI being used not only by media personnel but also by scientists and academicians. For example, AI can be used to create an attractive visual presentation on climate information, which can be used to simplify understanding for journalists, experts, and non-experts in telling different climate scenarios.

4. Also, AI can be used to channel specific messages to decision-makers in government and the private sector by tailoring their level of understanding to the better climate knowledge Despite the fact that AI plays a big role in climate communication, there is still a big risk in using AI to communicate climate information. AI is used to spread misinformation and disinformation. This is false information shared with to the public intentionally or unintentionally, result to misleading the public about climate issues.

Without media literacy, people are more easily tricked by those who deny climate change and use AI to spread false information. In this situation, AI is used to spread confusion instead of helping people understand the truth. This not only slows down important actions needed for climate change but also makes it harder for people to agree on what to do about it.

Though surprisingly, AI can be used as well to improve media literacy. For example, AI tools can be used to produce some scenarios for media personnel for them to understand a really practical and different experience in identifying dis- and misinformation. By saying this, media and AI, if they are used well together, can provide a good solution to tackle climate misinformation and dis-information.

Its very clear that a growth of AI technology is very dynamic and its very hard sometimes to understand how to deal with it in tackling Climate communication in five years to come. There is a gape especially to decision makers, most of them they are not very aware on the growth of this technology, which lead to decisions which which are not align with the speed of technology. Also a level of public literacy is still a challenge. Climate knowledge is still needed much, which on other hand we can say a level of trusting each and every information is very high. But, if everyone will do his/her job well AI can be a best technology of the current century to tackle Climate communication issues with low cost, time effective, no high level skills required and no much resources needed.

Conclusion

Artificial intelligence is an important tool in spreading information about climate change. It can help people understand the truth and encourage communities to take action against one of the biggest challenges we face today. But if not used carefully, it can also spread false information, slow down climate action, and confuse people about science.

The ability to understand and analyze media is what will decide if AI helps to communicate the truth about climate change effectively or if it keeps people misinformed. As AI keeps improving, we must also work on teaching people how to critically look at the information they receive. Only by creating a society that understands media well can we make sure that AI helps us fight climate change instead of making things harder.

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Impact of Climate Change on local Economy and Industry

Abstract:

Climate Change is for sure the greatest challenge faced by humanity. Its potentially devastating consequences pose a threat to human activities and to human life itself. It follows that we should act immediately to contain global warming, and to curb the emissions of greenhouse gases. To adopt the appropriate climate policies, we have to get to know the phenomenon and its characteristics as accurately as possible and obtain as complete a picture as possible of its damages. Three fundamental features of climate change have to be taken into consideration. First, while it is a global phenomenon affecting the whole world, environmental and socio- economic impulses and responses are radically different across regions. So, everybody is responsible for it, but the consequences, the impacts differ greatly across space. Climate change is a long-term phenomenon.

Assessing impacts on environmental and socio-economic systems requires a long-term perspective. That is to say, the knowledge of environmental and socio-economic dynamics, and of the feedback between the two, is still affected by a large amount of uncertainty. This work focuses on the impacts of climate change on both local economy and industry for a specific region of the world, which is the Mediterranean region. As it is argued, a knowledge of impacts that are region-specific is essential for the design of the appropriate policies to cope with a changing climate, especially from the point of view of vulnerabilities and the necessary adaptation measures.

Keywords:

Climate change, Local Economy, Industry, Humanity, Mediterranean

1. Introduction

Can climate change impacts local economy and industry in the Mediterranean? The two major answers to this question are:

The global warming predicted by climate models for the 21st century is a threat to most natural systems at every latitude and region. Since its implications are characterized by strong latitudinal variations (IPCC, 2001a, 2007), regional studies are proving to be an essential tool for scientists and decision-makers. The present paper investigates climate changes and associated sectorial impacts in the Mediterranean at the time of 2 °C global warming. A global mean temperature change of 2 °C is considered to be a critical level beyond which dangerous climate change occurs. For rising temperatures beyond 2 °C, increasing risks of extreme events, distribution of climate impacts or aggregated effects on markets are becoming a growing reason for concern (Smith et al., 2001). In addition, strong positive carbon cycle feedbacks are increasingly likely (Friedlingstein et al., 2003; Jones et al., 2003a,b), which would lead to even more climate change beyond the direct effect of anthropogenic emissions. While observations limit climatic analyses to local scales (e.g. Fontaine et al.,1999; Founda et al., 2004), this deficiency was overcome by climate models, which provide data on awide range of temporal and spatial scales. Regionalization of global models has been performed by three different techniques over the last decade. Statistical downscaling has been applied (Wilby et al., 1998), high-resolution “time-slice” atmospheric general circulation models (Gibelin and Déqué, 2003; Giorgi and Bi, 2005) and most recently nested regional climate models (Gao et al., 2006) have been developed. However, up to date, they have all focused on the 2071–2100 period as can be seen in the recent EU-funded projects PRUDENCE (Christensen et al., 2002; Räisänen et al., 2003; Giorgi et al., 2004; Deque et al., 2005) and MICE (Hanson et al., 2007), or they focus on an indeterminate period when a doubling of CO2 concentration occurs (Giorgi et al., 1992; Jones et al., 1997; Déqué et al., 1998).

Efforts to overcome this temporal limitation are underway through the European FP6 Ensembles project (http://ensembles-eu.metoffice.com). The closer time of a 2 °C global warming deserves attention, since a general drying has already been detected over most of the Mediterranean (IPCC, 2001b; Giorgi, 2006; Gao and Giorgi, 2008). The region’s sensitivity to drought and rising temperature are of prime interest for agriculture, tourism, water resources and policy makers. Summer temperatures are likely to increase by more than 2 °C, with a corresponding increase in the frequency of occurrence of severe heatwaves (Diffenbaugh et al., 2007). The 2003 heatwave in Europe (Beniston, 2004; Schär et al., 2004) has dramatically illustrated the need to provide projections of climate change for a time period earlier than 2070. Such a study has been performed by New (2005) for the Arctic. This might be beneficial mainly to stakeholders, policy makers and impacts people since they require shorter timescales for

their policy planning ahead. Since the time of a 2 °C global warming is expected between 2026 and 2060 (Section 2), at the time of the experimental runs for this paper, only General Circulation Models (GCMs) were available to assess the climatic characteristics in the Mediterranean during this period. Although GCMs present a range of sensitivity to greenhouse gas and aerosol forcing, which in turn depends on emission scenarios for future estimates, only data from one model, the HadCM3, have been used in the present study. As discussed in Section 2, the results are representative of the currently available global climate models for the considered time period.

Climatic changes are determined through comparison between control (1961–1990) and future (2031–2060) years. Means and extremes are used to describe future changes. Seasonal and yearly parameters are considered. The confidence in the estimated changes for each parameter is important and determined with the bootstrap method. 2. Method and the 2 °C global warming

2.1. Climate model data and the 2 °C warming New (2005) carefully addresses the time of 2°C global warming predicted by GCMs. Considering 21 climate change simulations from six GCMs and four IPCC emissions forcing scenarios, series of global mean temperature- anomalies, defined as difference with pre-industrial value, have been calculated. The time of 2 °C global warming found by New (2005) is between 2026 and 2060, depending on the sensitivity of the model to greenhouse gas forcing and to future scenarios.

The various series are reproduced in Fig. 1. Model comparison studies have shown that results from different models for the 2026–2060 period agree with one another fairly well, while most of the divergence takes place in the latter part of the century (2070–2100) (IPCC, 2001b). The same conclusion is drawn from Fig. 1, particularly if the outlier series cgcm1/2 IS92aGG (scenario with greenhouse gas only) is disregarded. The range of simulation results starts to really spread after 2060. To study the 2026–2060 period, considering 20 simulations, or just one with an average response, to forcing scenarios will give similar results although spatial differences may still be present among models.

The advantage of using one model resides in the knowledge of its weaknesses and shortcomings, which can prove important in interpreting results. In the present study, output from the HadCM3 model (Gordon et al., 2000; Pope et al., 2000) driven by SRES A2 and SRES B2 scenarios are used. The model couples an atmospheric GCM to an ocean GCM. Unlike earlier atmosphere–ocean GCMs, flux adjustment (i.e., additional artificial heat and freshwater fluxes at the ocean surface) is not required to produce a simulation. The high ocean resolution of HadCM3 is a key factor in this improvement. The atmospheric component of HadCM3 has 19 levels with a horizontal resolution of 2.5° of latitude by 3.75° of longitude, which produces a global grid of 96 by 73 grid cells. This is equivalent to a surface resolution of about 417 km by 278 km at the Equator, reducing to 295 km by 278 km at 45° of latitude (comparable to a spectral resolution of T42). Hence, the model geography is much simpler than the real-world geography. As an example, only two grid cells cover Greece, one land (northern Greece) and one sea (southern Greece) grid cell. When discussion is made about coastal areas in the text, reference is made to the model coast areas (transition areas between land and sea grid boxes), which may not fully coincide with real coast areas. Panel 1 displays the land–sea mask of HadCM3 over the Mediterranean.

The oceanic component of HadCM3 has 20 levels with a horizontal resolution of 1.25 by 1.25°. At this resolution it is possible to represent important details in oceanic current structures. Mediterranean water is partially mixed with Atlantic water across the Strait of Gibraltar as a simple representation of water mass exchange, since the channel is not resolved in the model. HadCM3 has been run for over a thousand years, showing little drift in its surface climate. The control run is basically the GCM being run for 240 years at 1961–1990 atmospheric concentrations. Any variation in the control run should stem from natural variability. The last 30 years of the control run, 1961–1990, are used here as reference for comparison with future predictions. The control run is unforced and thus common to any scenario that may apply after 1990.

Here we considered the A2 and B2 emissions scenarios. These depend on several drivers such as population growth, economic and technological development, natural resources etc (Nakicenovic et al., 2000). With a population of 15 billion by 2100, the A2 world undergoes a greater rate of warming than the B2 world with its medium 10.4 billion population projection and its focus on local solutions to economic, social and environmental sustainability.

For such a fractious discipline, there has been remarkable agreement among economists concerning the first-best climate policy. Ever since the writings of (Nordhaus 1977), (d'Arge 1979), and (Schelling 1992), it has been widely accepted that climate change is, on balance, a negative externality and that greenhouse gas (GHG) emissions should be priced, preferably taxed. Although there continues to be a vigorous debate about climate targets in the long-term (Stern et al. 2006; Nordhaus 2013), most economists agree that a sensible climate policy starts modestly and then accelerates (Wigley, Richels, and Edmonds 1996' Goulder and Mathai 2000). Despite this general agreement on the need to reduce GHG emissions, the debate among economists about climate change has been unusually bitter, perhaps as a reflection of the wider polarization of climate research and climate policy. In particular, estimates of the marginal impact of climate change vary so widely that the initial carbon price is more a matter of politics than economics.

1. Climate Change Impacts on Local Economy

Climate Change is arguably the greatest challenge faced by humanity. Its potentially devastating consequences pose a threat to human activities and to human life itself. It follows that we should act immediately to contain global warming and to curb the emissions of greenhouse gases. To adopt the appropriate climate policies, we have to get to know the phenomenon and its characteristics as accurately as possible and obtain as complete a picture as possible of its damages. Three fundamental features of climate change have to be taken into consideration. First, while it is a global phenomenon affecting the whole world, environmental and socio-economic impulses and responses are radically different across regions. So, everybody is responsible for it, but the consequences the impacts differ greatly across space. Second, climate change is a long-term phenomenon. Assessing impacts on environmental and socio-economic systems requires a long-term perspective. Third, the knowledge of environmental and socio-economic dynamics, and of the feedback between the two, is still affected by a large amount of uncertainty.

To determine whether and to what extent to act, the economist's approach is to determine the costs and the benefits of policies, including the cost of inaction. This requires a careful quantification of benefits, which here correspond to the avoided damages of climate change. This is only possible by first determining the economic impacts of climate change as thoroughly as possible. To that end three steps are needed. The starting point is the knowledge of the alterations to the climate system that are likely to occur at some point in a given region. As said, climate change is taking place globally, but there can be local effects which it is vitally important to be aware of. The second section is devoted to an illustration of this aspect, and notes that the Mediterranean is considered a "hotspot" of climate change.

2. Climate Change Impacts on Local Industry

Aquaculture in Mediterranean Sea Production trends In 2009, the total world seafood production reached 162 million tonnes, representing a 19% increase in production over the past decade (Fig. 1). This was entirely due to the

84% increase in aquaculture production, since capture fisheries declined in the same period by 3% (1999–2009). The technology applied has evolved rapidly as a result of the modifications of existing farming facilities and the development of new farming concepts, e.g. offshore submerged netcage technology. As a consequence, presently, a wide range of production activities of marine species co-exist in different Mediterranean environments using a variety of technologies, from extensive mollusc or fish production to highly intensive raceways or netcage fish farming. Mediterranean aquaculture production has increased by 77% over the past decade, especially in the brackish environment (Fig. 2), reaching about 1.3 million tonnes in 2009 (106 tons).

3. Climate Change and Mediterranean Aquaculture

Temperature Since 1970, south-western Europe has reported a temperature rise of about 2C (Tourre et al. 2008). Yet, by the end of the 21st century, an increase in air temperature between 2.2C and 5.1C is expected in the Mediterranean region (IPCC 2007, scenario A1B). This warming will have diverse impacts on aquaculture, depending on the production system, farmed species and country and region.

The intensive and semi-intensive inland aquaculture (see above) in northern (EU) Mediterranean countries is dominated by trout farming. These fish species have a very narrow optimal range of temperature and a relatively low upper thermal limit, and consequently, warming may significantly enhance trout mortality and affect productivity (Ficke et al. 2007). On the other hand, southern countries, such as Egypt, base their inland production on tilapia

farming, a group of fish with a wider optimal range of temperature and higher thermal limits. Analyses of current climatic trends reveal a warming trend in Egypt, with increases of 1.4C and 2.5C projected to 2050 and 2100, respectively (Agrawala et al. 2004). The expected water temperature rise will result in increased metabolism, growth rates and hence in overall production. Yet, it is worth noting that higher temperatures in the semi-arid regions with resulting evaporative losses coupled with increasing water demands will likely result in decreasing water availability from the Nile (Agrawala et al. 2004).

4. Sustainable Development and Adaptive Measures

The development and intensification of Mediterranean aquaculture has revealed a broad spectrum of associated environmental issues. The interaction between aquaculture and the environment is a varied and complex topic, in relation to sustainable development. Domestication and introduced species Domestication can contribute to a future sustainable Mediterranean aquaculture since it avoids the need to capture wild stocks. It is noteworthy that the potential impact on the wild ecosystem of fish escapes may be minimized, since cultured organisms can be selected to be unable to survive in wild conditions, dying in a short period of time and with a high percentage of organisms unable to reproduce (sterile organisms) (e.g. Omoto et al. 2005; Cal et al. 2006; Gagnaire et al. 2006).

5. How Scale Matters in theory

scale matters in studying global change, local dynamics are worth worrying about, and localities can make a difference. For instance, it is clear that some of the driving forces for global change operate at a global scale, such as the greenhouse gas composition of the atmosphere and the reach of global financial systems. But it seems just as clear that many of the individual phe-

nomena that underlie micro environmental processes, economic activities, resource use, and population dynamics arise at a local scale. In this paradox lies a dialectic that suggests the fundamental importance of scale.

6. The Domain Argument

The forces that drive global change arise from different domains of nature and society. Turner and his colleagues (Turner II et al., 1990) have broadly divided these domains into the systemic and the cumulative, identifying pathways by which regional problems become global ones.

Global systemic changes are direct changes in the functioning of a global system, as exemplified by effects of greenhouse gas emissions on the global climate system or ozone- depleting gases on the stratosphere.

7. The Agency Argument

The domain argument becomes even more salient when it is placed in the context of structure and agency. By agency, we mean intentional human action, and by structure we mean the set of institutions and other regularized, often formal social relationships within which such action takes place.

Conclusion

The Mediterranean region, also known as the cradle of western civilization, has been subject to human intervention for millennia. Due to religious and social traditions, seafood is consumed widely in this region, with an average of 16.5 kg/capita/year (quite similar to the global average: 16.7 kg/capita/year), and ranging from 5.2 in Algeria to 40.0 in Spain (FAO 2011). The growth of seafood demand in the Mediterranean is expected to increase in the future, especially in southern countries (Cochrane & de Young 2007). One fourth of the Mediterranean seafood supply comes from aquaculture activities, whereas the remaining is from fisheries. The Mediterranean aquaculture sector has expanded over the past decades. It increased 77% over the past decade reaching about 1.3 million tonnes in 2009. Along with predicting vulnerable areas, the selection of suitable sites in relation to specific culture methods and species will be valuable in maximizing profit and food production in the face of a changing climate. The impacts of climate change will relate particularly to water availability and/or quality, due to the expected rise in evaporation, decrease in rainfall, and more frequent and violent extreme events (heat waves, droughts or floods) in this region. For adaptation these climate trends, and consequent environmental changes, the key focus on Mediterranean aquaculture will be on selecting suitable species and culture methods.

Even if advances in technology may offer some protection from climatic shocks, the consequences of climate change for inhabitants of this region continue to depend on the long- term interplay between an array of societal and environmental factors. As documented in this article, the Mediterranean is a critical example of a region with high vulnerability and where climatic change may have sizable physical and economic impacts. Historically, various adaptation responses have emerged over time, some of them drastic, entailing migration and changes in societal structures.

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Climate Change Threats to the Biodiversity in the Mediterranean

Abstract:

The Mediterranean region is a notable biodiversity hotspot in the world. But this region, known for its unique geographical location, is vulnerable to climate change effects as seen in extremes such as heatwaves, heavy precipitation, floods, sea level rise, droughts, tropical cyclones, and changes in rainfall patterns. However, these climate change effects are major threats to biological diversity in the Mediterranean region.

The objective of the paper was to examine climate change threats to biodiversity in the Mediterranean region. This paper relied on secondary data and adopted a systematic methodology to review existing literature on climate change as a threat to biodiversity in the Mediterranean region. The paper found that biological diversity in the region is severely impacted by climate change. While the paper concludes that biodiversity in the Mediterranean region is at risk, it recommends that countries across the three continents that make up the Mediterranean region should work towards reducing emissions significantly and show real commitment to climate policies.

Keywords:

Climate Change, Biodiversity, Global Warming and the Mediterranean Region.

Introduction

Climate change is an increasingly serious threat around the world. This global phenomenon is mainly caused by human activities through the emission of greenhouse gases such as CO2 and methane into the atmosphere. This practice is responsible for the increasing global average temperature of the earth's surface, which IPCC (2023) pegged at "reaching 1.1°C above 1850-1900 in 2011-2020."

Humans depend heavily on fossil fuels (oil, coal, and natural gas) to meet energy needs. However, the burning of fossil fuels increases greenhouse gases and contributes greatly to climate change. According to Kaddo (2016), greenhouse gases have the potential to trap heat.

As in many regions, some of the noticeable effects of climate change in the Mediterranean region are seen in extremes such as heatwaves, heavy precipitation, floods, sea level rise, droughts, tropical cyclones, and changes in rainfall patterns. All these effects, however, are major threats to biological diversity in the Mediterranean region, especially as the increase in the frequency and intensity of climatic events is driving ecosystem shifts and affecting the ecological interactions of species.

The objective of the paper was to examine and present an overview of scholarly articles on climate change threats to biodiversity in the Mediterranean region.

Climate change and the Mediterranean region

The Mediterranean region consists of countries bordering the Mediterranean Sea. The sea itself and the climate of the area vary by geographic location (Bottenberg, Schanus, Kluss, & Kuball, n.d.).

Notably, the Mediterranean region is home to unique cultural richness and diversity originating from three continents – Africa, Asia, and Europe. For Solomou, Proutsos, Karetsos & Tsagari (2017), the Mediterranean region is a "climate and a global hot spot of biological diversity and the richest biodiversity region in Europe."

However, one unique reality across these continents is climate change, a global phenomenon that has continued to threaten ecosystems with unique ecological and socioeconomic significance.

According to El-Askary & Li (n.d.), the Mediterranean area has emerged as a hotspot for climate change and the issues arising out of it. Thus, most Mediterranean land ecosystems are "impacted negatively by drier conditions, causing the ranges of many endemic species to shrink, and the health and growth rates of trees to decline" (Kovats et al., 2014; Niang et al., 2014; Nurse et al., 2014; Settele et al., 2014, cited in Ali, Cramer, Carnicer, Georgopoulou, Hilmi, Cozannet, & Lionello, 2022).

Worthy of note is that the Mediterranean is vulnerable to climate risks especially as hot, dry summers and cool, humid winters characterize the climate of the region. In North Africa for example, "an average temperature rise of 2 to 3°C is expected by the middle of the century, particularly in mountainous regions, although more moderate in coastal areas. Annual precipitation is likely to decrease – except mid-winter — together with shifting cyclone patterns, leading to drier conditions and reduced groundwater replenishment" (Schilling

et al., 2020, cited in Jürgen, 2020).

The Mediterranean Basin is faced with existing environmental problems caused by changes in issues such as land use, increasing pollution, and declining biodiversity. However, these problems have been exacerbated by climate change. Now, current change and future scenarios consistently point to significant and increasing risks during the coming decades (Cramer, Guiot, Fader, Garrabou, Gattuso, Iglesias, Lange, Lionello, Llasat, Paz, Peñuelas, Snoussi, Toreti, Tsimplis & Xoplaki, 2018).

Essentially, “climate change effects have already begun to be felt throughout the Mediterranean. All warming scenarios in the Mediterranean predict an increase in drought and heat events, and a reduction in precipitation within the next hundred years in the Mediterranean basin with important consequences for local vegetation communities” (Solomou, Proutsos, Karetsos & Tsagari, 2017).

Climate change threats on biodiversity in the Mediterranean region

The Mediterranean is vulnerable to the impacts of climate change as the region is constantly exposed to heat waves, drought, and increased risk of coastal flooding. Extreme warming events caused by climate change have contributed largely to biodiversity loss in the Mediterranean.
The Mediterranean Basin is one of the world’s richest places in terms of animal and plant diversity. This diverse region, with its lofty mountains, ancient rivers, deserts, forests, and many thousands of islands, is a mosaic of natural and cultural landscapes, where human civilization and wild nature have coexisted for centuries (Cuttelod, García, Abdul Malak, Temple & Katariya, 2008).

Scholars seem to agree on the unique and diverse biological diversity in the Mediterranean region.

The unique conjunction of geography, history, and climate has led to a remarkable evolutionary radiation that continues to the present day, as animals and plants have adapted to the myriad opportunities for life that the region presents. The Mediterranean is particularly noted for the diversity of its plants – about 25,000 species are native to the region, and more than half of these are endemic – in other words, they are found nowhere else on Earth. This has led to the Mediterranean being recognized as one of the first 25 Global Biodiversity Hotspots. Besides this great richness of plants, a high proportion of Mediterranean animals are unique to the region: 2 out of 3 amphibian species are endemic, as well as half of the crabs and crayfish, 48% of the reptiles, a quarter of mammals, 14% of dragonflies, 6% of sharks and rays and 3% of the birds. The Mediterranean is also hosting 253 species of endemic freshwater fish. Although the Mediterranean Sea makes up less than 1% of the global ocean surface, up to 18% of the world’s macroscopic marine species are

found there, of which 25 to 30% are endemic – an incredibly rich biodiversity for such a small area (Bianchi & Morri 2000; Myers et al. 2000, cited in Cuttelod, et.al, 2008).

Specifically, this section will examine this diverse region and discuss how climate change threatens biodiversity.

Humans

Extreme climatic events such as floods and droughts have major impacts on humans and have displaced millions from their homes in the Mediterranean region. For example, once sea level rise occurs, it often leads to coastal flooding. This event often leads to the loss of lives and properties. Below are some ways climate change affects humans:

a. **Health:** Scientists have traced different human health problems to climate change. Heat waves for example, often result in vector-borne diseases. When there are cases of flooding, stagnant water breeds flies and mosquitoes which have negative impacts on human health.
b. **Security and conflict:** Several countries in the Mediterranean region are currently experiencing conflicts, most of which are exacerbated by climate change. Water scarcity and changes in rainfall patterns – which are attributed to climate change – have triggered internal conflicts.

Ali, et.al (2022) argued that "Climate impacts may not in itself have caused social and political unrest but can contribute to them. The conflict in Syria has occurred after the drought that marred the country in the years before, but there is no evidence for direct causal linkage."

Conflict is not a new phenomenon in the Mediterranean region. Jürgen (2020) argued that the region has historically been a hotspot of geopolitical conflicts. The last three decades have seen numerous conflicts in the Mediterranean Sea. Although several challenges triggered some of the conflicts faced in the region, climate change has become a major contributor – now seen as a "connector and multiplier of risks, interwoven with the region's geopolitical dimensions, including natural disasters, water and food shortages, energy transformation, human migration, conflict, and cooperation" (Jürgen, 2020). Generally, the climate-conflict nexus is complex (Kyungmee & Garcia, 2023).

Climate change has implications for various forms of interstate and intrastate conflict, including communal violence, insurgencies, mass civil resistance campaigns, protests, and interpersonal disputes. Specific contexts of environment, socio-political systems, and pre-existing conflict matter when examining the connection between climate-related environmental changes and conflict. The analytical framework is based on the premise that the relationship between climate change and conflict is mediated by social, political, and ecological vulnerability (Hendrix et al. 2023; Daoudy 2021, cited in Kyungmee & Garcia, 2023).

Climate change can trigger conflict in different ways and considering that climate change has an impact on human security, Kyungmee & Garcia (2023) opined that "when climate impacts contribute to social outcomes such as deteriorating livelihood conditions, migration, escalation of armed groups' tactics, and elite capture, risks of violent conflict can increase."

c. **Agriculture:** Agriculture is the largest global user of biodiversity and about one-third of the world's area is under cultivation (Kumar, 2020). Since agriculture production is directly dependent on climate change and weather, possible changes in temperature, precipitation, and CO2 concentration in the atmosphere are expected to significantly impact crop growth and yields. Climate change leads to variability in rainfall patterns, heat stress, spread of pests and diseases, and shortening of the crop cycle and affecting plant growth and production (Kumar, 2020).

As in many regions in the world, the agricultural sector is important for most Mediterranean economies, both in terms of GDP and employment, with its share of the total GDP in the region at 6.7% in 2016 (Kutiel, 2019, cited in Ali, et.al, 2022).

Across the Mediterranean region, climate change is emerging as a significant contributor to food insecurity, considering how it impacts the pattern and intensity of rainfall. The resultant effect of this is the threat to agricultural production. And when rainfall exceeds the soil's capacity for absorption, it leads to flooding, which could lead to widespread destruction of crops.

d. **Water shortage:** In the Mediterranean region, water security has been reduced. This according to El-Askary & Li (n.d.) is caused by climate change evident in the "recurrent droughts and impending desertification, which threaten not only the economic viability of the region, but also its geopolitical stability."

Water shortage is a common trend in the Mediterranean region, with each country facing peculiar challenges. Researchers aptly explain the situation in different countries when they submitted this:

In Spain for example, 11 out of 15 river basin districts are under water stress due to demand from agriculture. In Greece, the largest agricultural region (Thessaly) where 70% of the irrigation water comes from groundwater, is under water stress. For cropping systems in MENA countries, the Nile Valley and the western parts of North Africa on the Atlas Mountains are classified as the areas with the highest vulnerability. Grassland and pastoral systems are also vulnerable to increasing drought, notably in the western part of the basin. Increased heat stress in summer negatively impacts animal health and welfare, i.e., increased incidence of diseases and mortality or lower fertility (Vargas and Paneque, 2019, ESCWA, 2017, Balzan et al., 2020, Gemitzi & Lakshmi, 2018, Lacetera, 2019, cited in Ali, et.al 2022).

A major problem in the Mediterranean region is water scarcity and droughts. Water resources are unevenly distributed with critical limitations in the southern and eastern parts of the Mediterranean basin. Now, countries in the region will be faced with the challenge of meeting high water demands from all sectors with less available freshwater water resources (Cramer et. al, 2018).

Meanwhile, water shortages affect virtually all aspects of human endeavours. The deterioration of livelihood conditions in the Mediterranean is a "centerpiece in linking environmental changes and violent conflict;" and climate-exposed sectors such as agriculture, forestry, fishery, energy, and tourism are highly likely to suffer from economic damages from climate change (IPCC 2022, SPM-11, cited in Kyungmee & Garcia, 2023).

Essentially, water scarcity and droughts can pass as a source of social disputes and non-violent conflict (Feizi et al. 2019; Bijani et al. 2020; Ide et al. 2021, cited in Kyungmee & Garcia, 2023). However, "whether the tension over water scarcity escalates to non-violent conflict or not seems to be contingent on the pre-existing negative socio-political relationships between groups and the types of political systems" (Ide et al. 2021, cited in Kyungmee & Garcia, 2023). In Iran for example, irregular rainfalls and water scarcity at the local level are linked to interpersonal conflict and communal tensions and can degrade state legitimacy and contribute to political instability (Feizi et al. 2019; Bijani et al. 2020, cited in Kyungmee & Garcia, 2023).

Yet, Jürgen (2020) argues that water shortage will increase with global warming and affect precipitation, glaciers, land degradation, desertification, and food production in the region. Jürgen further puts this in perspective:

Together with projected population growth, access to safe drinking water and green water for agriculture will likely decline. Agriculture is the biggest consumer of water. In Egypt, most water for agriculture comes from the Nile, while other countries in the region mostly rely on precipitation, making the region sensitive to its decline. To prevent the depletion of groundwater, extraction should not exceed replenishment. The imbalance between water demand and supply, and the confrontation between key political actors exacerbate the water crisis.

Also, agriculture dependency is one of the best predictors of violent conflict (von Uexkull et al. 2016, cited in Kyungmee & Garcia, 2023). Sectors such as agriculture, fisheries, and livestock are particularly susceptible to the loss of income due to climate shocks such as prolonged droughts (von Uexkull, 2014; Schmidt & Pearson 2016, cited in Kyungmee & Garcia, 2023). Once there is a loss of income, people may be forced to explore illicit activities as alternative sources of livelihood (Barnett & Adger 2007; Seter 2016, cited in Kyungmee & Garcia, 2023).

Vegetation

Scientists argue that increasing atmospheric CO2 concentration has a significant influence on plants' photosynthesis. Specifically, rising concentrations of CO2 in the atmosphere increase photosynthesis rates and vary with plant nitrogen status and species. Therefore, warming, an increase in drought and heat events, and a drastic reduction in precipitation are likely within the next hundred years in the Mediterranean basin with important consequences in photosynthesis, growth, and survival of local vegetation (Ainsworth & Long, 2005; Bussotti, Ferrini, Pollastrini, & Fini, 2014, cited in Solomou, Proutsos, Karetsos, & Tsagari, 2017).
Wildlife

Just like humans, terrestrial and marine wildlife are also very sensitive to climatic changes. An increase in average temperatures could result in habitat loss or even affect the survival rate of wildlife in cases where they are forced to search for food and water outside the home. Additionally, Kumar (2020) notes that due to a shift in flowering patterns, wildlife food availability is being affected which may pose a serious threat.

Meanwhile, Cuttelod, et.al (2008) argued that the "Mediterranean's importance for wildlife is not limited to the richness or uniqueness of its resident fauna and flora: millions of migratory birds from the far reaches of Europe and Africa use Mediterranean wetlands and other habitats as a stopover or breeding sites."

Species provide us with essential services – not only food, fuel, clothes, and medicine, but also purification of water and air, prevention of soil erosion, regulation of climate, pollination of crops by insects, and many more. In the Mediterranean, they provide a vital resource for the tourism and fishing industries, as well as having significant cultural aesthetic and spiritual values. Consequently, the loss of species diminishes the quality of our lives and our basic economic security. From an ethical point of view, species are part of our natural heritage and we owe it to future generations to preserve and protect them. In addition to its thousands of species of fauna and flora, the Mediter-

ranean region is home to some 455 million human inhabitants, from a wide variety of countries and cultures. Poor people depend heavily on natural resources and the loss of biodiversity is undermining the potential for economic growth, affecting the security of populations and limiting their options (Cuttelod, et.al. 2008).

Mangroves and Rainforest

Mangroves are coastal forests that grow in brackish water. Mangrove ecosystem plays unique and significant ecological roles in fighting climate change by preventing flooding and acting as shoreline protection against storms.

According to Alongi (2022), “climate change impacts on mangroves have received considerable attention due to rising temperatures, sea level, and greenhouse gas concentrations, changes in ocean circulation and precipitation patterns, and increasing extreme weather events. Mangrove responses depend on whether critical thresholds are reached. High temperatures and low precipitation lead to extreme warming events, driving increasing mangrove mortality.”

Additionally, while the increase in sea level is putting the mangrove ecosystem at risk, mangrove deforestation is a major problem in the Mediterranean region.

Rainforest, on the other hand, plays critical ecological roles. As rich biological diversity hotspots, rainforests host endangered species - both fauna and flora. But increase in temperature continues to threaten this ecosystem across the Mediterranean region, which has caused the migration and extinction of some important terrestrial species.
Besides, increasing wildfires largely caused by high-temperature conditions continue to threaten protected areas daily in the Mediterranean. Now, tropical rainforest in this region is faced with increasing risk of wildfire both from high-temperature conditions and farmers who have been affected by climate change and are now trying to expand their farmlands.

Methodology

This paper relied on secondary data and adopted a systematic methodology to review existing literature on climate change as a threat to biodiversity in the Mediterranean region.

Results

Based on the objective of this paper which is to examine how climate change is a threat to biodiversity in the Mediterranean region, findings from the systematic review of existing relevant literature showed that the Mediterranean region, which is a global major biodiversity hotspot, is severely impacted by climate change, and each country in the region faces its own peculiar or unique challenges.

Conclusion

Climate change is a global phenomenon that affects everybody worldwide. In the Mediterranean region, climatic shocks and hazards have led to the deaths of thousands of people, plunged many into poverty, and exposed millions of people in the region to health risks and food insecurity.
In the Mediterranean region, while average annual temperatures are now

approximately 1.5°C higher than during the pre-industrial period (1880-1899) (MedECC, 2019), sea level rise is the origin of multiple risks for low-lying areas in the Mediterranean Basin (Ali, et.al, 2022).

The problem is widespread. While natural causes such as volcanic eruption cause climate change, human activities - mainly burning fossil fuels - contribute a larger percent of the global climate crisis, and the effect of this remains a major threat to biodiversity which plays major ecological roles on the planet. No doubt, biodiversity in the Mediterranean region is at risk. To fight climate change, humans must reduce the emission of greenhouse gases and also remove atmospheric carbon using advanced technologies or adopt nature-based solutions such as seaweed cultivation and mangrove restoration.

Recommendations

Based on the findings of this paper, the following recommendations were made:

a. **Engage and involve relevant stakeholders:** The climate change phenomenon is deep and so, it needs the active involvement of scientists, academics, local communities, and other relevant stakeholders. To achieve this, governments across the Mediterranean region must consciously engage and involve relevant stakeholders in climate change discussion and associated policy implementation.

b. **Reduce emissions and show commitment to climate policies:** The Mediterranean region's unique geographical location and rich biodiversity make it even more vulnerable to climate change impacts. For this, countries in the region should unite and set up a strong institutional framework to tackle climate-related issues. Also, these countries should show real commitment to their numerous climate policies to reduce emissions significantly. At the end of the day, climate impact is measured not by existing policies but by action and desired results.

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Ethics of humanity and Ethics of AI. Links, conflicts and solutions

Abstract:

This paper explores the ethical interplay between human values and artificial intelligence (AI) in addressing climate change. While AI offers unparalleled capabilities in data analysis, predictive modeling, and resource optimization, its efficiency-driven logic often conflicts with human ethical principles like equity, justice, and accountability. We examine both the synergies and tensions between these ethical frameworks.

Key findings reveal that integrated solutions—combining technological innovation with robust ethical oversight—are essential to ensuring AI-driven climate action is not only effective but also equitable. The proposed ethical frameworks aim to align AI capabilities with human-centric climate goals, fostering sustainable and just outcomes for both present and future generations.

Keywords:

Artificial intelligence (AI),
Climate change,
Ethical frameworks,
Equity, Technological innovation.

Introduction

The global challenge of climate change requires urgent and coordinated action. It is widely recognized as one of the most pressing ethical issues of our time, as its impacts disproportionately affect vulnerable populations, future generations, and ecosystems that lack a voice in policy discussions (Stanford Encyclopedia of Philosophy, n.d.).

Addressing this crisis involves complex decision-making processes that balance mitigation efforts, adaptation strategies, and equitable resource distribution. Artificial Intelligence (AI) is increasingly seen as a critical tool in these efforts, offering advanced capabilities in climate modeling, resource optimization, and predictive analytics (European Commission, 2024).

However, as AI systems become more influential in shaping climate policy and actions, ethical concerns emerge about their design, deployment, and impact on society (AI Now Institute, n.d.-a).

AI can process vast amounts of climate data and identify patterns that humans might miss, improving the efficiency and accuracy of climate strategies. Yet, these systems are not neutral; they reflect the values and biases embedded by their developers and the data they are trained on. This creates potential conflicts with human ethical frameworks, which prioritize equity, justice, and intergenerational responsibility.

For example, AI might optimize resource use in ways that maximize immediate environmental benefits but inadvertently harm marginalized communities. Such scenarios highlight the need for a deeper examination of how human and AI ethics intersect in the context of climate change.

While human ethics emphasizes fairness and moral responsibility, AI systems are designed to prioritize efficiency and outcomes based on predefined metrics. This divergence can lead to conflicts, particularly when AI recommendations conflict with human notions of justice or when they perpetuate existing inequalities. These challenges underscore the importance of developing ethical frameworks that align AI's capabilities with the broader goals of human-centered climate action.

2. Literature Review

When it comes to climate change, ethics isn't just a matter of philosophical debates—it's about real-world consequences. How do we decide who gets what in a world with shrinking resources? How do we balance the needs of today with the rights of future generations? These are questions human ethics has been grappling with for centuries.

Artificial Intelligence, the shiny new tool everyone's talking about, promising to revolutionize climate action. Someone said once - with great power comes great responsibility, and that's where things get tricky…

Ethics of Humanity in Climate Action Human ethics, particularly in the climate arena, is grounded in ideas like fairness and justice. It's about making sure that decisions don't unfairly burden the poor or future generations while the rich keep getting richer. Concepts like climate justice and intergenerational equity pop up a lot in these conversations (UNESCO, n.d.). Basically, it's about asking, "Who suffers, who benefits, and who decides?"

And the most important is a global perspective, joint effort—countries working together to tackle the crisis, even if some have historically done more damage than others..

AI in Climate Change Mitigation and Adaptation Now, AI steps onto the stage like a tech-savvy superhero. It can crunch numbers, predict weather patterns, and optimize resources faster than any human could (Technology Review, 2024).. For example, AI helps predict where disasters like floods or droughts might hit hardest, allowing for better preparation. It's also being used to improve energy efficiency, monitor deforestation, and even help farmers adapt to changing climates. Sounds great, right? But there's a catch—AI doesn't understand why these things matter. It's all about patterns and probabilities, not people's lives and stories.

AI is a tool, not a moral compass. And the decisions it makes are only as ethical as the data it's fed and the goals it's programmed to prioritize. That's where things start to rub against human ethics.

Ethical Frameworks for AI in Climate Action So, how do we make sure AI plays nice? There's a lot of buzz around ethical AI, with concepts like transparency, accountability, and fairness taking center stage. The idea is that AI shouldn't just be efficient—it should also be fair and explainable. Now, we want to know - how does this AI system make its decisions, who's responsible when things go wrong, and, whose interests are being served?

The literature talks about things like bias audits and explainable AI (XAI) as tools to keep AI in check. But these solutions often stop short of addressing the bigger picture: how AI fits into the broader ethical framework of climate action. If an AI system suggests cutting down fewer trees in wealthy neighborhoods while sacrificing rural ones, is it really fair? And how do we ensure that marginalized voices are heard in this high-tech decision-making process?

3. Methodology

Let's face it—climate change isn't waiting for us to figure things out. It's here, and how do we make sure that AI, our most promising tool in the fight, works in a way that's fair and just?

This study adopts a two-part approach: ethical analysis and case study review. The ARTIFACT project provides a prime example of AI's role in urban flood resilience (Institute for Artificial Intelligence Research and Development of Serbia [IVI], 2024). During the October 2024 Tuscany floods, AI systems effectively predicted flood paths, guiding emergency response (Climameter, 2024).

Comparative Ethical Analysis (Bridging Two Worlds): Think of it as a conversation between two very different minds: one steeped in centuries of moral philosophy (us), and the other driven by cold, hard data (AI).

Why does this matter? AI systems might optimize for the "biggest bang for the buck" solutions, but human ethics demands a closer look at the communities that often bear the brunt of climate disasters without seeing much of the benefits.

Case Study: AI and the October 2024 Tuscany Floods In October 2024, heavy rains turned Tuscany's rolling hills into rivers, flooding towns and displa-

cing thousands. AI was called in to manage everything from predicting flood paths to directing emergency services.

AI systems crunched massive amounts of weather data and historical flood patterns, creating real-time models to predict where water levels would rise next. Local authorities leaned heavily on these predictions to decide where to send aid and how to evacuate people. Did the system prioritize urban centers over rural areas? Were its decisions transparent, and did they hold up to scrutiny when things didn't go as planned?

While AI delivered incredible speed and accuracy, it also raised some tough ethical questions: Was the response equitable? Did vulnerable communities get the support they needed, or were they left to fend for themselves because they weren't "high-priority" zones?

And this isn't about pointing fingers — it's about figuring out how we can make AI a true partner in our fight against climate change. Because let's be real, we're going to need all the help we can get.

Future oriented projects: Serbian IVI connected with European best partners
The ARTIFACT project, short for "Artificial Intelligence for Flood Resilient Infrastructure," is a collaborative initiative under the European Union's Horizon Europe program. Spearheaded by the Institute for Artificial Intelligence Research and Development of Serbia (IVI), the project unites Serbian expertise with leading European institutions, including Delft University of Technology (TU Delft), IHE Delft Institute for Water Education, and Hamburg University of Technology (TUHH). Launched on October 1. 2024, and set to run until September 30. 2027, ARTIFACT aims to enhance urban flood resilience by integrating artificial intelligence with engineering solutions. The project focuses on developing advanced AI models for urban flood forecasting, incorporating both green and gray water infrastructure, and establishing a Blue-Green AI Hub in Serbia to bridge research with the regional ICT industry.

4. Links Between Human and AI Ethics in Climate Action

When it comes to tackling climate change, humans and AI bring different strengths to the table. At first glance, their ethical systems might seem worlds apart, but dig a little deeper, and you'll find some interesting overlaps.
Let's break down where these two ethical realms align and how they can complement each other in the fight against climate change.

Shared Principles

AI's contribution to climate governance aligns with human ethical principles of sustainability and transparency. Explainable AI (XAI) promotes understanding and accountability in decision-making (PLOS Climate, n.d.). Equity is central, ensuring fair distribution of climate resources.

Both human and AI ethics, in their ideal forms, are rooted in the concept of sustainability. That means that the actions we take today don't compromise the ability of future generations to thrive. Humans have long debated this through concepts like intergenerational justice, where the goal is to protect future human rights to clean air, water, and a stable climate.

AI systems, although devoid of emotion or moral intuition, can be designed to prioritize long-term outcomes by optimizing resource use and predicting future environmental impacts.

In human ethics, transparency is about ensuring that decisions are made openly, with all stakeholders understanding the process. In climate governance, this could mean clearly communicating why certain regions receive more resources during a climate crisis or how emissions reduction targets are set.

Similarly, transparency in AI involves making its decision-making processes understandable and explainable. Applied to climate models or disaster response systems, this can build trust and facilitate better collaboration between humans and machines.

Equity is a cornerstone of human ethics in climate action. It demands fairness in distributing the benefits and burdens of climate policies.

AI systems, when designed correctly, can be powerful allies in promoting equity. For example, during disaster response, AI can quickly analyze data to identify the most vulnerable populations and allocate resources accordingly. This aligns with human ethical principles of prioritizing those who need help the most.

However, the link here isn't automatic. AI's data-driven nature can enhance equity only if the data it relies on is representative and unbiased. When both human oversight and AI's analytical power are combined effectively, they can create a system that not only responds to crises efficiently but also does so justly. AI doesn't operate in a vacuum—it reflects the values and priorities of the humans who design and deploy it. This is where the ethics of humanity directly shape AI systems.

If climate policy emphasizes values like protecting vulnerable ecosystems or ensuring global equity, these priorities can be embedded into AI algorithms. In turn, AI can process complex datasets and suggest policy interventions that align with these human-defined goals.

Collaboration, Not Competition The most promising aspect of the relationship between human and AI ethics is their potential for collaboration.
AI can handle the heavy lifting—analyzing massive datasets, forecasting climate trends, and optimizing resource use. On the other hand, humans bring an understanding of moral principles, cultural contexts, and the experiences of communities affected by climate change.

Together, they form a partnership where human values guide AI's capabilities, creating more holistic and effective climate solutions.

5. Conflicts Between Human and AI Ethics in Climate Action

In climate action, conflicts between humans and "machines" arise from fundamental differences in how decisions are made, prioritized, and justified.
One of the most significant conflicts in climate action arises in the balance between equity and efficiency. Human ethics prioritizes fairness, ensuring that marginalized communities, often the least responsible for climate change, are not disproportionately affected. In contrast, AI is designed to optimize for efficiency, directing resources where they will yield the greatest overall benefit (AI Now Institute, n.d.-b). This approach can sideline vulnerable areas that do not meet efficiency criteria, leaving those who need help the most at a disadvantage.
Accountability and the black box problem further complicate the use of AI in climate decisions. In human-led processes, accountability is straightforward:

decisions can be traced back to individuals or institutions. However, when an AI system determines critical actions like evacuations or resource distribution, it's unclear who holds responsibility if outcomes are harmful (Emerald Insight, 2021). This issue is compounded by the "black box" nature of many AI systems, where even experts struggle to explain how specific decisions are made. In life-and-death scenarios, this lack of transparency can lead to mistrust, reducing public acceptance of AI recommendations, even when they are sound.

The issue of data bias and inequality also poses a significant challenge. AI systems are only as reliable as the data they are trained on, yet climate data often reflects biases. Wealthier regions with robust monitoring infrastructures tend to dominate datasets, while poorer or rural areas are underrepresented. As a result, AI-driven solutions can inadvertently reinforce existing inequalities, overlooking vulnerable communities during crises like heatwaves.

When it comes to short-term vs. long-term goals, AI often focuses on immediate, measurable outcomes. For instance, it may recommend planting fast-growing trees to sequester carbon quickly. While effective in the short term, such strategies can disrupt ecosystems and harm biodiversity, which are critical for long-term climate resilience. Human ethics, by contrast, tends to take a broader view, considering the ecological and societal impacts over time.
Finally, the tension between privacy and predictive power arises from AI's reliance on extensive data collection. While this data improves the accuracy of climate predictions and enhances policy effectiveness, it also raises significant privacy concerns. Human ethics emphasizes protecting individual rights, including the right to privacy, which can conflict with the

collective need for detailed climate monitoring. Balancing these competing priorities remains a critical challenge in ensuring ethical AI deployment in climate action.

6. Proposed Solutions

The conflicts between human and AI ethics call for innovative solutions that align AI's strengths with human values. There are several practical approaches to bridge these ethical gaps, ensuring that AI serves as a powerful ally in tackling climate change while upholding principles of justice, equity, and accountability.

Ethical frameworks for AI in climate action must prioritize transparency, fairness, and public engagement (European Commission, 2019). XAI and bias mitigation techniques help align AI systems with these principles.

Ethical integration frameworks should embed ethical considerations into every stage of AI development and deployment, rather than treating them as an afterthought. Clear policies and regulations are essential to guide the ethical use of AI in climate action. Governments and international bodies need to establish universal guidelines, regularly audit AI systems for biases, and ensure public participation in developing and deploying climate-related AI systems.

Technology itself can address many of the ethical challenges AI faces. Explainable AI (XAI) helps demystify decision-making processes, fostering trust and accountability. Bias mitigation techniques ensure AI systems do not perpetuate inequalities, while adaptive learning systems enable AI to refine its decisions based on ethical feedback from affected communities.

To function ethically, even the most advanced AI systems rely on human input. Developer training in ethical principles and climate justice is crucial, alongside interdisciplinary teams that blend expertise in climate science, ethics, and public policy. Engaging directly with communities provides valuable insights, ensuring AI solutions are locally relevant and inclusive.
Given the evolving nature of both climate change and AI, governance models must remain flexible. Real-time monitoring and feedback loops are critical to continuously assess and improve AI systems, ensuring they adapt responsibly to new challenges and uphold ethical standards.

7. Discussion

In the race to combat climate change, the collaboration of AI and human decision-making has the potential to redefine how we address one of humanity's most pressing challenges. However, as with any powerful tool, AI's use in climate action must be carefully managed to avoid unintended consequences.

With this discussion I'll try to delve into the implications of integrating AI into climate governance, the challenges we face, and the opportunities for future advancements.

Implications for Climate Governance AI's ability to process and analyze vast amounts of data in real-time can revolutionize climate governance. Governments and organizations now have the means to make more informed decisions, optimize resource allocation, and predict climate patterns with unprecedented accuracy. However, this shift also alters the power dynamics in decision-making.

Integrating AI into climate governance brings opportunities and challenges. Its ability to process vast data sets enables informed decision-making, but biases in data or decision processes can exacerbate inequalities (ETH Zurich, n.d.). Collaborative frameworks can bridge gaps between AI's capabilities and human ethical values.

AI systems are often controlled by a small number of entities, such as governments or tech companies, which raises concerns about transparency and inclusivity. Who decides which data is prioritized? Who determines the algorithms' goals? These questions highlight the need for democratic oversight and shared governance in AI deployment.

With AI, the stakes of accountability become more complex. While human-led decisions can often be traced back to individuals or organizations, AI introduces a layer of abstraction. Clear frameworks must define responsibility for AI-driven outcomes, especially in cases of failure or bias.

Challenges and Limitations Despite its promise, the integration of AI in climate action comes with significant challenges that cannot be ignored.

AI systems rely on data, and their effectiveness is only as good as the quality of that data. In many regions, particularly in the Global South, climate data is incomplete or outdated. This creates a risk of AI systems perpetuating existing inequalities, as decisions based on skewed data may further marginalize vulnerable populations.

AI systems operate within the constraints of their programming. They excel at optimizing for specific goals but lack the nuanced understanding of ethical

trade-offs that human decision-makers consider. For instance, an AI might prioritize reducing carbon emissions but fail to account for the social impact of displacing communities in the process.

Implementing AI-driven systems in climate governance requires significant shifts in infrastructure, policy, and mindset. Resistance from stakeholders—whether due to fear of job displacement, loss of control, or mistrust of technology—can slow adoption and limit AI's potential impact.

Future Research Directions To fully realize the potential of AI in climate action, further research is needed in several key areas: Climate change is a global issue, but ethical priorities vary across cultures. Developing AI systems that respect and integrate diverse ethical perspectives will be crucial for ensuring equitable solutions.

The intersection of AI, climate science, and ethics is still relatively new. Future research should focus on fostering collaboration across disciplines to develop holistic solutions that balance technical efficiency with ethical considerations. While much focus has been on AI's role in mitigation (e.g., reducing emissions), its potential for adaptation strategies remains underexplored. How can AI help communities prepare for and respond to the inevitable impacts of climate change, such as extreme weather events or sea-level rise?

In the Horizon funded ARTIFACT project, by analyzing weather patterns, land use, and water flow data, AI hopefully could predict extreme weather events like floods, offering early warnings to at-risk communities. These insights enable authorities to implement timely evacuation plans, allocate resources efficiently, and design flood-resilient infrastructure to minimize future risks.

Opportunities for Collaborative Solutions By combining AI's analytical capabilities with human oversight, we can create adaptive systems that learn from real-world outcomes. For example, flood prediction models could be continuously updated based on new data and community feedback, improving accuracy and relevance over time.

When designed with inclusivity in mind, AI can empower local communities to take ownership of climate solutions. For instance, AI-driven platforms could provide farmers with personalized insights on sustainable practices, tailored to their specific environmental conditions.

Climate change doesn't recognize borders, and neither should our solutions. AI offers a unique opportunity to foster international collaboration by providing a shared platform for data analysis and decision-making. By aligning AI systems across nations, we can ensure a more coordinated and effective global response.

9. Conclusion

The integration of AI in climate action has the potential to revolutionize our approach to one of the greatest challenges of our time. However, as this paper has explored, the ethical interplay between human values and AI-driven systems is complex. While AI offers unparalleled capabilities in efficiency, precision, and scalability, it lacks the intrinsic moral compass that guides human decision-making. This misalignment can lead to ethical conflicts, particularly when decisions affect vulnerable populations or long-term ecological sustainability (UNESCO, n.d.).

Key findings highlight the shared principles between human and AI ethics, such as sustainability and transparency, which provide a foundation for collaboration. However, there are conflicts in areas like equity, accountability, and the trade-off between short-term efficiency and long-term ethical goals. These tensions underscore the need for integrated ethical frameworks that align AI's technological strengths with human-centric values.

Such frameworks must be dynamic, adapting to the evolving nature of both climate challenges and AI technologies. They should ensure that AI not only supports climate mitigation and adaptation but does so in a way that is fair, transparent, and inclusive. Policy interventions, technological innovations like Explainable AI, and interdisciplinary collaboration are essential steps toward this goal.

Ultimately, the responsible integration of AI into climate action is not just a technical challenge—it is a moral imperative. By bridging the ethical divide, we can harness AI's potential to build a more sustainable and equitable future, where technology serves humanity and the planet.

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SHARON TSHIPA
Journalist, some media outlets

Country
Botswana

The Thousand words a picture is worth, and the role they play in promoting public engagement for climate action

Abstract:

Photojournalism has long played a crucial role in shaping public discourse and raising awareness about critical global issues. As the world grapples with the increasingly complex challenges posed by the “wicked problem” of climate change, challenges such as extreme weather events that have since become a huge source of vivid and shocking imagery that is attracting substantial media coverage and motivating scholarly articles, this paper argues that the need for effective public engagement has become more pressing than ever. Hence, it explored how photojournalism is evoking climate change public engagement, more so at a time when artificial intelligence emerges as a transformative tool that can strengthen the capacity of photojournalism to drive meaningful climate change dialogue and action. To ensure the rigour of its argument, the paper utilised the inductive qualitative content analysis method.

The data collection process dwelt on purposively sampled journal articles published between 2023 and 2024. The year 2023 was chosen because it is the warmest year on record with an average global temperature of 1.45°C above the pre-industrial average while 2024 is the year scientists suggest is on track to being the first year in which the planet is more than 1.5oC hotter than in the 1850-1900 pre-industrial period. Findings suggest that photojournalism is enhancing public engagement in climate change, yet there is room for improvement of photojournalism is going to translate to significant climate action. The use of artificial intelligence in ensuring the delivery of visually engaging imagery that can significantly invoke public engagement, results show it is highly favoured despite the threats that the technology poses.

Keywords:

Photojournalism, public engagement, climate communication, sustainable development, artificial intelligence

Introduction

Though climate change disproportionately affects regions, countries, districts, communities, families and individuals, no one can simply dismiss the overall felt and seen effects that have buried (landslides), swept (cyclones), washed away (floods), or burned down (wildfires) homes, entire communities, and crops, to cite a few losses and damages that have become

synonymous with the climate phenomena (Abbass et al., 2022; Arnell, 2019). What is not surprising is that these human rights threats attract extensive media coverage i.e., videography, audio, text and photography. Spurred by significant historical events, the rise of iconic publications, the digital revolution, avid internet access, and the proliferation of digital platforms, photographic visual content (Pavlina, 2023) is now applauded for its multifaceted role in climate change public engagement, Nurmis (2017).
Photojournalism in climate communication

Photojournalism, to be specific, helps to translate complex scientific concepts into more accessible visual narratives (Nurmis, 2017) by 'visually documenting and communicating the objective truth about a situation, providing viewers with a visual representation of events that occurred, thereby telling a story, providing a unique perspective on current events' (Onyejelem, 2023), and inducing emotions for greater news engagement (Paik et al., 2023). Through its 'immersive storytelling possibilities' (Pavlina, 2023), photojournalism is thus attributed for enabling cross-border communication as there is no need for discursive interpretation, and the effective visual framing of the urgency and severity of climate change (Nurmis, 2017). Though it may fail to showcase its root causes or possible solutions, photojournalism highlights the adverse impacts of climate change and showcases how climate change is deeply embedded in people's everyday lives (Nurmis, 2017; O'Neill, 2020; Wijaya et al., 2020). Ultimately, it shapes public perception and influences policy decisions related to climate change while acting as a mediator between science and the public, (Nurmis, 2017; O'Neill, 2020; Wijaya et al., 2020).
Despite these advantages, this paper's major concern is that though photojournalism is applauded for being 'a powerful conduit for storytelling in an era characterized by information overload and visuals have become a key currency for capturing and retaining audience attention' (Pavlina, 2023), it is not as pervasive as it should be in media houses. The lack is quite noticeable in the Global South where photographic equipment is viewed as expensive. Limited budgets in the Global South newsrooms—attributed to the declining print circulation, the proliferation of free online content, subscription fatigue, and the dominance of tech platforms in the digital advertising space (Pavlina, 2023)—do not permit photojournalists to embark on the necessary travel required to document the full effects of climate change (Tshipa and Thakadu, 2023). Thus, local media e.g., in countries like Botswana have been found to re- use images by large international media houses such as the BBC, Xinhua News Agency, The

Guardian, and Reuters, to cite a few (Tshipa and Thakadu, 2023). It is therefore not surprising that images of melting glaciers dominate the pictorial language (Doyle, 2007), while those of drought and heatwave burdened African nations tag along. Images widely circulated to date also include 'a set of peopleless photographs taken in 2006 of a falling home erosion in the village of Shishmaref, Alaska, which were circulated in reporting about the relocation of the village due to climate change (Herrmann, 2019).
Another downside is that though photojournalism highlights the adverse impacts of climate change, some view it as failing to showcase its root causes

or possible solutions (Nurmis, 2017). Solutions journalism is therefore trying to bridge this gap as visual reporting is also considered solutions journalism. A study by Dahmen et al. (2021) suggests that narrative engagement can play an important role in involving audiences in visual solutions reporting, and that solutions visual reporting is more engaging on average. Further, when audiences are more engaged in the visual solutions reporting, their study findings suggest that participants report more positive outcomes for interest, self-efficacy, and behaviour intentions. Though efforts are being made to redress the challenges, a formidable foe in the form of Artificial Intelligence (AI), which comes with the "watered down hook, line, and sinker" of transforming creative processes, has since risen.

The threat of artificial intelligence

Though there is a consensus that photojournalism is already playing a crucial role in climate change public engagement by visually conveying the severity and impact of environmental issues, thereby making them more relatable and urgent to the public, the emergence of AI is, to some extent, is as a threat as images can be 'digitally manipulated, thereby creating misleading or false narratives—spreading misinformation' (Pavlina, 2023). A study by Onyejelem (2023) further stresses that 'the proliferation of AI-driven editing software and image manipulation techniques threatens to undermine the credibility of photojournalism, as manipulated images can easily lead to the erosion of public trust in visual media'. Since 'ensuring the authenticity of visuals in an era of fast-paced information dissemination is a constant challenge' (Pavlina, 2023), deepfakes or photorealistic CGI, are already being blamed for phoney political media', which does not help since the climate change phenomena is highly politicised (Bereskin, 2023; Tongia, 2024). End-users of media messages are not always media literate, thus, they are not always aware that the images they are viewing were designed to replicate the nuances of real-world entities, nor can they fact-check e.g., 'perform an inverse

search of images, to find out if it has been manipulated and/or that no use has been made of photos out of context for misinformation purposes' (Agnoletti, 2018). That said, this essay shares Bereskin's (2023) sentiment that 'the advent of hyper-realistic synthetic media, particularly contextually believable deepfakes, underscores the necessity for public scepticism and rethinking the adage 'seeing is believing'.

To counter the AI threat, multi-stakeholder collaborations by entities such as Partnership on AI, and Coalition for Content Provenance and Authenticity (C2PA) have united to fight against synthetic disinformation. For one, 'C2PA's crucial innovation lies in a specification that embeds reliable data into images, thereby hindering tampering' (Bereskin, 2023). This method of fingerprinting digital content, Bereskin (2023) posits has gained traction, notably in photojournalism, with prototypes being used in Ukraine document war effects. Other innovations such as PhotoGuard, Bereskin (2023) further suggests could be utilised by media outlets to 'immunize' their images against synthetic manipulation, adding small, undetectable changes that resist tampering. Such tools, if integrated into legislative requirements, the scholar adds, could greatly assist in the identification, prevention and mitigation of disinformation spread.

Though the 'rapid speed of AI developments, the complexity of its components, varying definitions of harm, and the need to assess potential damages effectively' (Tongia, 2024) seems to be challenging, efforts being made show that there is hope in ensuring that AI does not become a threat to the role of photojournalism in public engagement.

That said, this paper determined if and how photojournalism is enhancing public engagement in climate change, as the need for effective public enga-

gement has become more pressing than ever. The paper adds to knowledge by responding to Omondi's (2024) assertation that 'opportunities remain for research to reflect more of the ubiquity of crises and the increased focus on the use of visuals in crisis communication in the last decade', and the reiteration that visual communication is understudied, particularly in crisis contexts. In their study, Husain et al. (2023) posit that 'although there is a ton of material about environmental online campaigns and photo communication in the tools used for their research, very few of them combined the two into a single topic, hence the current study fills this gap. However, it goes an extra mile, expanding the research by adding AI, as it emerges as a transformative tool that can strengthen the capacity of photojournalism to drive meaningful climate change dialogue and action.

2. Methodology

2.1 Data collection, sampling and analysis

Journal studies published between 2023 and 2024 were retrieved within google scholar, a web-based 'academic search engine which catalogues between 2 and 100 million records of both academic and grey literature' (Haddaway et al, 2015, p. 1). It was opted for because it collates results from across the internet (Haddaway et al, 2015). The year 2023 was chosen because it is the warmest year on record with the average global temperature of 1.45°C above the pre-industrial average while 2024 is the year scientists suggest is on track to being the first year in which the planet is more than 1.5oC hotter than in the 1850-1900 pre-industrial period. For journal studies with the photojournalism and artificial intelligence proclivity, the year 2023 was also opted for because it is the period during which artificial intelligence went mainstream.

Searching the first 10 pages of the results as determined by the platform's algorithm, the data collection process utilised key words such as 'photojournalism, public engagement, climate change, newspapers, visuals'.

The initial search yielded 22 journal articles. Journals that were automatically left out were those that did not focus on photojournalism and climate change. Further screening and de-duplication resulted in 17 purposively sampled articles that met the predefined criteria. The subsequent data analysis was conducted using Atlas.ti, employing procedures such as coding and thematic analysis.

3. Results and Discussion

This paper argued that since 'images are ubiquitous in everyday life and are a key part of the communication process that is shaping peoples' attitudes and policy preferences on climate change' (O'Neill, 2020), photojournalism is already enhancing public engagement in climate change but the need for deliberate widespread effective public engagement has become more pressing than ever given the wicked problem of climate change. In a quest to rigorously defend this argument, the paper explored how photojournalism is evoking climate change public engagement that can support the localisation of SDG 13, more so at a time when artificial intelligence emerges as a transformative tool that can strengthen the capacity of photojournalism to drive meaningful climate change dialogue and action.

To effectively do this, the paper assessed 14 (82%) journal articles that dwelt on photojournalism, public engagement, and climate change. Though the paper found a dearth of studies which assess the triangular connection between photojournalism, climate change, and AI, at (5.9%, n = 1), while two additional

studies that were considered (11.8%,) had a photojournalism and AI focus, results suggest that artificial intelligence is already advancing the attainment of SGD 13.

3.1.1 Enhancing public engagement in climate change

In a majority of the studies reviewed (64.7%, n = 11) there is strong evidence that photojournalism is already enhancing public engagement in climate change (e.g., see Lopes and Azevedo, 2023; Mooseder et al., 2023; Tetzlaff et al., 2024). This consensus is motivated by the common view that 'visuals matter during crises as they are more accessible and understandable, have higher retention and engagement and positively impact risk perception' (Omondi, 2024).

To invoke public engagement photojournalists were found to employ themes such as devastation, emotional messaging, resilience, realism, global warming, pollution, melting glaciers, and rising sea levels, reflecting the multifaceted nature of the discourse on climate change (e.g., see Habib and Zahra, 2024). In 'emphasising some aspects of a situation at the expense of others to promote particular attributions and interpretations over others, potentially guiding audience interpretation of information' (Omondi, 2024), framing thus played a crucial role in ensuring success. Results by Harvard and Hyvönen (2023) further 'indicate that practitioners gravitate toward variations of a "gateway strategy," in which motives and forms of visual presentation are chosen as gateways to bypass the potential resistance or indifference to climate change messages, thus guaranteeing an increased level of success. Among notable frames highlighted by the journals analysed, is the reference to 'iconic images of oil-soaked birds that have raised awareness and galvanized responses to environmental crises' (Habib and Zahra, 2024).

Though largely considered indispensable in raising awareness—since the 1960s following 'the advancement of communication technologies' (Husain et al., 2023), and increasing climate change public engagement (Mooseder et al., 2023), when overdone, framing is accused of reducing public engagement in climate change. For one, Saoud (2024) notes that 'the stress-induced lessens awareness of images related to climate change, while Habib and Zahra (2024) reiterate that 'in Pakistan, media coverage of floods often emphasises negative aspects, potentially fostering helplessness and hindering disaster preparedness'.

While Harvard and Hyvönen (2023) are concerned that audiences become desensitised and immune to terrible things happening around the world because they were told so often and in such a
broad sense and in so many places", other scholars point to Solutions Journalism as a solution to the problematic nature of frames and recurrent climate change themes (e.g., see Lopes and Azevedo, 2023; Saoud, 2024). In their paper, Lopes and Azevedo (2023) found the proportion of visual frames depicting potential solutions and adaptation strategies has increased substantially, while Saoud (2024) refers 'to pictures of climate solutions that show examples of what each person can do to start positive actions and energy choices'.

Given this discussion, it is clear that the question is not whether photojournalism can enhance public engagement for climate change, as it is already fulfilling that role. The question then becomes, how exactly is photojournalism invoking public engagement? The following section seeks to respond to this question.

3.1.2 Storytelling and narrative techniques for Climate Change public engagement

Results of the current paper suggest that storytelling and narrative techniques are crucial tools widely utilised in ensuring the efficacy of photojournalism in enhancing climate change public engagement across the world (e.g., see Habib and Zahra, 2024; Husain et al., 2023). While Husain et al. (2023) propose that 'every image needs to have its own storytelling, as storytelling can result in increased awareness among audiences', Habib and Zahra (2024) highlight the work undertaken by Time magazine. The scholars describe the work as evocative visual narratives that artfully portray the profound effects of climate change through a lens that captures the resilience, vulnerability, and adaptation of communities grappling with environmental challenges. Venturing further, the authors give an example of flood images, stating that they showcase the emotional and societal impact, emphasizing the urgency and communal efforts required to navigate perilous situations.

Other varied elements that can further advance public engagement that are highlighted by the studies analysed include: i) the inclusion of heat-vulnerable people within the images selected, and ii) align images of extreme heat in news coverage with evidence-based public health messages (Tetzlaf et al., 2024), iii) respect to gender representation, the climate change imagery in online (Parveen, 2023), and utilise visually engaging imagery (Harvard and Hyvönen, 2023). All of this, the current argues should be done with the goal to strengthen public resilience and readiness to act, thus translating to enhanced climate change public engagement.

3.2. The role of AI in advancing photojournalism for climate change public engagement

Among the studies analysed, there is consensus that visual journalism—photography in the context of this paper—is a 'dynamic and influential force, shaping how audiences consume and interact with news and information' (Pavlina, 2023). Advancing this role play is AI, which is accredited for 'revolutionising the way photographs are captured, edited, and analysed, thus opening up new possibilities and challenges for photographers and photojournalists' (Onyejelem, 2023). Overall, this paper found the positives (n=30) of AI to outweigh the negatives (n=23). What further gave the AI positives additional leverage were its present uses in photojournalism and the prospects it promised.

3.2.1 The AI positives

In photojournalism, results suggest that AI adoption is favoured because the technology is significantly transforming the field of photography and photojournalism, offering advanced capabilities and revolutionising various aspects of the industry (Onyejelem, 2023). News production automation was found to be the most prevalent AI characteristic among all the studies analysed. This Generative AI attribute is preferred because of its ability to reduce time- consuming tasks (Paik et al, 2023; Pavlina, 2023; Onyejelem, 2023), 'enabling journalists to focus on more complex aspects of storytelling' (Pavlina, 2023). The second endorsement of AI was found centred on its ability to generate high if not higher quality images capable of provoking emotions similar to those evoked by real-world images (Paik et al, 2023; Onyejelem, 2023).
In their study, for one, Paik et al. (2023) found that 'once the headlines were revealed, for both human-selected and AI-generated news images, the predominant emotions were approval and sadness for the climate change topic.'

In climate change protest headlines, Paik et al. (2023) found 'AI-generated images to often provide comparable or indepth context to the news story than did the human-selected images'. 'When comparing the emotional impact of news images in different news topics, the authors also found that the AI system was better at generating both higher news quality and human-like images in the context of climate change compared to gun violence'. What all this suggests is that AI can advance the efficacy of photojournalism in promoting public engagement that can fuel increased climate action. In fact, AI is already doing this as in the example of 'the Los Angeles Times which uses Quakebot, an algorithm that automates the reporting of latest earthquake news' (Paik, 2023). Pail et al. (2023) also make reference to another project which developed a climate change visualizer that produced AI-generated images of cities affected by environmental changes such as floods, storms, and wildfire, all in an effort to 'use emotions for a social cause, though individuals' emotional responses to AI-generated images may not always be consistent or predictable across individuals or contexts, such as topics on climate change'.

Other AI positives highlighted by the studies assessed by this paper are AI's ability to proffer personalised visual content, immersive user experiences, inclusivity opportunities, easy image editing, reduced newsroom production costs, and reduced competition for stock images. What the current paper found most interesting is AI's ability to detect manipulated images. This is given the tool's potential to be used to create deepfake images that can spread misinformation (Onyejelem, 2023). Not forgetting privacy and consent issues (as automated algorithms can analyse vast amounts of visual data, including personal photographs, often without the explicit permission of the individuals involved), and the use of AI in facial recognition technologies which poses ethical questions concerning surveillance and infringement of civil liberties (Onyejelem, 2023). Therefore, this paper shares Pavlina's (2023) sentiment that for visual journalism to remain a vibrant and indispensable pillar of the information-rich society, the journey forward requires a commitment to ethical storytelling, technological innovation, diversity, and sustainable practices.

3.2.2. The AI negatives

Of the total articles analysed, the negatives found majorly concerned themselves with the deceptive use of AI. In their study, Paik et al. (2023) stress that 'publicly accessible generative tools can also perpetuate mis and dis-information and contribute to the spread of fake news'. Ethical issues that arise from the misuse of AI also came out strongly, as e.g., 'the use of generative AI to produce and disseminate hyper-realistic news images fundamentally goes against one of the main pillars of photojournalism ethics which stipulates that no real-life images should be distorted, manipulated, stereotyped, or staged' (Paik et al., 2023; Pavlina, 2023).

Additional AI negatives that were found by the current paper include social media's constant demand for visual content and 24/7 coverage, job security threats as production processes are automated, the rise of amateur photographers who devalue the profession, and regular hardware and software changes (Onyejelem, 2023). Plaik at el., on the other hand noted that AI generated images can be confusing and less informative, that the too many emotions they generate can make it difficult to control the narrative, while social biases and stereotypes can be reinforced.

To overcome some of these challenges and guarantee the effective role of photojournalism in driving climate change public engagement, the journals

analysed emphasised the need to: i) upskill photojournalists so they adapt and thrive in AI driven environment, and ii) for photographers and photojournalists to be cautious and transparent about their use of AI (Onyejelem, 2023, Paik et al., 2023.

Conclusion

Overall, this essay argues that since 'images are ubiquitous in everyday life, since they are a key part of the communication process that is shaping peoples' attitudes and policy preferences on climate change' (O'Neill, 2020), photojournalism is already enhancing public engagement in climate change. Photojournalism is accomplishing this by making the climate issue more accessible, relatable, urgent, emotionally impactful, and actionable (evidence based). Thus, by engaging the public in meaningful ways, this essay concludes that photojournalism ultimately encourages people to participate in solving environmental issues. Though climate change photojournalism faces threats such as limited newsroom budgets, and possible AI manipulation, research shows that ample efforts can be done and are being made to counter the problems, thereby ensuring that photojournalism continues to play a significant role in motivating public engagement in climate change issues. To counter their budget problems, Pavlina (2023) suggests posits that 'embracing novel approaches to storytelling and audience engagement, and by leveraging engaging visual content to drive subscriptions, memberships, and donations from an invested audience', news outlets can create value, attract audiences, and diversify revenue streams. On the other hand, instead of maintaining its dual reputation as a threat and a blessing, Sandalow (2023) suggests AI can be viewed as good, as it can help with e.g., cutting emissions of greenhouse gases, thus, helping make significant contributions to climate mitigation through emissions monitoring, the power sector, manufacturing, materials innovation, the food system and road transport

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The impact of climate change on the Future of Food, Agriculture and Irrigation in the Middle East and Africa

Abstract:

The Middle East and North Africa (MENA) region faces acute climate change challenges, particularly affecting food security, agriculture, and water resources. Characterized by arid and semi-arid climates, the MENA region is experiencing rising temperatures, reduced rainfall, sea level rise, and increased frequency of extreme weather events.

This report examines the implications of these climatic changes on agricultural productivity, water availability, and food systems, emphasizing the region's dependency on scarce water resources and rain-fed agriculture. With agricultural yields threatened by prolonged droughts, soil degradation, and water stress, adaptation strategies such as climate-smart agriculture, advanced irrigation techniques, and drought-resistant crop varieties are explored. The study highlights the necessity of regional cooperation, policy reform, and investment in sustainable practices to mitigate the adverse effects of climate change. By adopting integrated water management, promoting renewable energy, and enhancing food production resilience, MENA countries have the potential to address current vulnerabilities and transition toward a sustainable agricultural future.

Keywords:

Climate Change, Food Security, Water Scarcity, Agricultural, Productivity, Drought Adaptation, Strategies Climate, Smart Agriculture, Water Management Desalination Soil Degradation Irrigation Technologies Heat, Stress

1. Introduction

1.1 Overview of the MENA Region

The Middle East and North Africa region includes 19 countries, which are grouped as follows: Levant, Gulf, Iraq, Egypt, Sudan, and the Maghreb.

The climate of the Middle East and North Africa region is characterized by:
- Very dry areas in the desert, particularly in the Arabian Peninsula.
- Cold mountainous areas, and humid conditions in the Levant.
- Iraq, North Africa, and Yemen are located near coastal plains with semi-dry climates.

1.2 Climate Change in the MENA Region

Climate change impacts have been clearly observed in MENA, with projected effects worsening by 2050. These include:
- The average temperature is steadily increasing, especially during the summer months.
- Changes in rainfall patterns have become more frequent. Some areas are becoming more dehydrated.
- Sea level rise poses a long-term threat to coastal communities in MENA.
- Average summer and winter temperatures are expected to rise by 2°C and 1.5°C, respectively. For example, in Baghdad, the temperature during summer can reach hazardous levels of 40°C, which poses risks to human health and food security.
- Reduced fishing due to changes in temperature and ocean acidity.
- Sea level rise affecting low-lying areas like Alexandria and the Nile Delta, which impacts soil drainage and leads to saltwater intrusion into groundwater.

Water resources have become more difficult to manage due to increased variability and uncertainty in rainfall prediction. This is compounded by population growth, especially due to the influx of refugees as a result of geopolitical conditions in the region. Droughts are expected to become more severe, particularly in the Mediterranean region, with statistics showing worsening conditions in Morocco, Tunisia, and Algeria. Crop yields are significantly reduced in some areas, and without adaptation measures, the region faces reduced agricultural productivity. For example, barley yields in Jordan are projected to decline by 22%, and wheat yields in Syria may decrease by 23%. High temperatures are also expected to spoil food more quickly, which, combined with limited refrigerated storage, further threatens food security. However, investing in new technologies and drought-resistant crops can counteract some of these disruptions.

2. Climate Change Impacts

2.1 Agricultural Dependency and Vulnerability

Agricultural production in the MENA region depends heavily on natural resources such as land, water, and climate, in addition to infrastructure, manpower, and financial and policy preparations. The entire MENA region is considered a climate change hotspot, with climate models predicting temperatures 20% higher than global averages. The region is already the most water-scarce in the world, with increased temperatures likely leading to more severe and persistent droughts.

- More than 60% of the population has little access to safe drinking water.

- Approximately 70% of the region's GDP is exposed to water stress.
- About 70% of MENA's agricultural production is dependent on rainfall, making the region highly vulnerable to changes in temperature and rainfall patterns.

Simon Steele, Executive Secretary of the UN Office on Climate Change, stated: "The Middle East and North Africa (MENA) region is at a crossroads, facing not only the devastating effects of climate change but also the challenge of transforming its economies to ensure prosperity in a world in line with a 1.5°C warming."

Additionally, Inger Andersen, Executive Director of the United Nations Environment Programme (UNEP), emphasized: "Climate change is not a foreseeable threat – the MENA region knows this from first-hand experience with extreme heat waves and water shortages. At this Climate Week, I invite participants to seize the opportunity to forge a resilient future for the MENA region and beyond. Let's harness innovation and inspire transformative action because every part of a degree matters."

3. Socioeconomic Impacts

3.1 Heat Stress and Economic Losses

On average, poor households lose 5% of their total income annually due to heat stress, compared to 4.4% for non-poor households. This climate-induced income gap between rural poor and non-poor populations results in approximately $21 billion in losses from floods and over $20 billion annually from thermal stress.

Long-term temperature increases also lead to rising dependence on agriculture, particularly for poor households. This makes them highly vulnerable to climate change, as agricultural incomes are projected to decrease by 53% for poor households with every 1°C increase in temperature. Conversely, non-agricultural incomes in these households will decline by 33%.

4. Agricultural Challenges and Opportunities

4.1 Water Scarcity and Land Degradation

The MENA region is one of the driest and most water-stressed areas globally. It has 97% of its land classified as arid or semi-arid. The region also faces transboundary water conflicts over major rivers like the Nile, Euphrates, and Tigris, with disputes over water rights likely to intensify during droughts. Over-extraction of groundwater for irrigation has led to rapidly falling water tables, which are exacerbated by increased salinization.

Desertification is affecting around 2.1 million square kilometers of land annually, further reducing the availability of productive land. Urbanization is also encroaching on agricultural land, reducing the available area for farming.

4.2 Climate-Induced Challenges for Agriculture

- Increased frequency of extreme weather events, including droughts, which have historically occurred every few decades, is now happening every 5-10 years.
- Heat stress is adversely affecting livestock health and productivity.
- Technological barriers, such as a lack of digital infrastructure in rural areas, limit the potential for precision agriculture.

- Poor access to agricultural extension services reduces farmers' knowledge about sustainable farming practices.

5. Adaptation and Mitigation Strategies

5.1 Water Management Innovations

- Desalination and Water Recycling: These technologies can help supplement freshwater supplies, though they come with high costs and energy demands.
- Modern Irrigation Techniques: Expanding the use of drip and sprinkler irrigation systems can significantly reduce water usage compared to traditional flood irrigation.

5.2 Climate-Smart Agriculture

- Agroforestry and Soil Conservation: These practices improve soil health, increase biodiversity, and provide alternative income sources for farmers.
- Improved Forecasting and Early Warning Systems: Better meteorological services can help farmers anticipate weather-related risks and adapt their practices accordingly.

5.3 Policy and Economic Reforms

- Integrated Water Resource Management (IWRM): Cross-border water management agreements and comprehensive water conservation plans are critical for sustainable water use.
- Subsidy Reforms: Redirecting subsidies towards sustainable practices, such as the adoption of water-efficient technologies or drought-resistant crops, can improve resource utilization.

5.4 Research and Development Investments

- Strengthening regional research institutions to focus on arid agriculture will help develop locally adapted solutions, including new crop varieties and innovative farming techniques.

Conclusion

The MENA region faces pressing challenges due to climate change, including reduced agricultural productivity, water scarcity, and economic instability. However, with the adoption of sustainable farming practices, technological innovation, and regional cooperation, the region can overcome these challenges and transition to a more resilient and sustainable agricultural future. By investing in renewable energy, integrated water management, and climate-smart agriculture, MENA countries have the potential to lead in global efforts to mitigate climate change and ensure food security.

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What changes might be required in Serbia regarding travel and transport?
(Laws, behavior, educaton)

Abstract:

Climate change represents one of the most significant challenges that the world faces in the 21st century. Global warming, caused by excessive greenhouse gas emissions, results in a range of serious consequences for the environment, economy, and human health. The problems caused by climate change are varied:

1.Rising Temperatures
According to the Intergovernmental Panel on Climate Change (IPCC) report, global temperatures have risen by approximately 1.1°C compared to pre-industrial levels[1](IPCC, 2021). This temperature increase leads to extreme weather events, such as heatwaves, droughts, and floods.

2. Rising Sea Levels
The same report predicts that sea levels will rise by 0.5 to 2 meters by the end of the century if appropriate measures are not taken *(IPCC, 2021). This has serious implications for coastal communities, including the loss of housing and threats to biodiversity.

3. Loss of Biodiversity
Climate change contributes to habitat loss and species extinction. A 2020 World Bank report indicates that six out of ten species could become endangered due to changing climatic conditions [2](World Bank, 2020).

Keywords:

Serbia, transport, climate change, infrastructure, public transportation, mobility, Green Deal, railway, environmental protection

1* Intergovernmental Panel on Climate Change (IPCC). (2021). "Sixth Assessment Report."

2 World Bank. (2020). "The Economic Case for Climate Action."

4. Impact on Agriculture
Changes in climatic conditions affect agricultural production, potentially leading to food shortages and rising prices. An analysis by the Food and Agriculture Organization (FAO) states that global food production could decline by 10-30% by 2050 if greenhouse gas emissions are not reduced[3](FAO, 2021).

5. Effects on Human Health
Climate change also impacts human health. Increased temperatures and extreme weather conditions contribute to a rise in cardiovascular and respiratory diseases, as well as the transmission of infectious diseases[4](World Health Organization, 2018).

Recognizing the issue of climate change and aiming to showcase the best ecological solutions to help mitigate its impact on our environment, from 2022. the Educational Science Program of Radio Television of Serbia has been broadcasts positive examples of ecological practices across Europe that can be applied in Serbia. Several examples from the field of transport are presented.

Introduction

The Impact of Transportation on Climate Change

According to the International Energy Agency (IEA), the transportation sector is responsible for approximately 24% of global CO2 emissions [5](IEA, 2020). This sector includes private cars, public transportation, freight traffic, and air transport. The main causes of emissions include:

- Use of Fossil Fuels
Most vehicles rely on gasoline or diesel, contributing to increased CO2 emissions. Transitioning to electric vehicles and alternative fuels could significantly reduce these emissions.

- Urbanization and Increased Traffic
As cities grow, the demand for transportation rises, leading to traffic congestion and additional emissions. More efficient public transport and infrastructure changes are crucial for reducing negative impacts.

- Globalization
Increased trade necessitates greater freight transportation, which also contributes to emissions. Changes in logistics and the use of more environmentally-friendly transportation methods are essential.

Globally, numerous initiatives and plans are aimed at combating climate change. Some of the key plans include:

- Paris Agreement
Adopted in 2015, this agreement aims to limit global warming to below 2°C, with efforts made to reduce it to 1.5°C. Signatory countries commit to reducing greenhouse gas emissions[6](United Nations, 2015).

- National Action Plans
Many countries are developing strategies to lower emissions and enhance resilience to climate change. These strategies often include measures to improve public transportation, upgrade infrastructure, and promote sustainable practices.

- Initiatives to Reduce Transportation Emissions

Organizations like the International Energy Agency and the World Health Organization work on promoting sustainable transportation, including the development of electric vehicles and the enhancement of public transport systems.

Climate change is a complex issue that requires global cooperation and urgent action. The impact of transportation on greenhouse gas emissions is significant, but there are various strategies and initiatives that can help mitigate this impact.

Transportation in Europe

The European Green Deal represents an ambitious initiative of the European Union aimed at achieving climate neutrality by 2050. This agreement encompasses a wide range of sectors, with transportation standing out as one of the most important and complex areas that need transformation due to its significant impact on greenhouse gas emissions.

Transportation in Europe accounts for approximately 25% of total CO2 emissions, making a substantial contribution to global warming, with fossil fuel vehicle traffic being the largest portion of these emissions.[7](EU 2022).

One of the main strategies of the European Green Deal is the "decarbonization" of the transportation sector. This involves a shift to more sustainable forms of transport, such as electric vehicles, improved public transportation, and increased use of bicycles.

For example, Kristine Munkgard Pedersen from the Environmental Administration of Copenhagen highlights for "Green Europe" that the city has invested significant resources and efforts to achieve comprehensive cycling infrastructure. Fifty percent of Copenhagen's residents are cyclists, and there are many more bicycles than cars in the city—roughly a 5:1 ratio in favor of bicycles. There are more than 750,000 bicycles in the city, meaning there are actually more bicycles than residents. This didn't happen by chance; they built the infrastructure that supports cycling, with bicycle paths spanning 380 kilometers throughout the city. In the past decade, they have constructed bicycle bridges connecting different parts of the port, making it quicker for cyclists to traverse from one side to the other. The orange bicycle snake designed by the Dissing+Weitling architects opened about ten years ago and has become a popular shortcut through the city, used daily by twenty thousand cyclists.

Additionally, the city of Vienna has launched a strong campaign to invest in bicycle infrastructure. Just last year, 44 projects were initiated to build an additional 17 kilometers of bicycle paths in the main traffic network and improve existing ones.

Vienna has been building bicycle paths for years to increase the percentage of citizens who use bicycles daily. Construction began in the 1980s, and since then, the cycling infrastructure has expanded. Today, there are approximately 1,400 kilometers of well-maintained bicycle paths in Vienna, said Martin Blum, Director of Vienna Agency for Mobility for „Green Europe". Through the Green Deal, the European Union has a vision of reducing CO2 emissions in transportation by at least 30% by 2030 compared to 2020 levels[8].(EU Green Deal).

3 Food and Agriculture Organization (FAO). (2021). "Climate Change and Food Systems."

4 World Health Organization. (2018). "Climate Change and Health."

5 International Energy Agency (IEA). (2020). "Global Energy Review 2020."

6 United Nations. (2015). "Paris Agreement."

7 European Commission, Transport Emissions Report 2022.

8 European Green Deal.

The European Green Deal also foresees economic support and incentives for developing infrastructure that enables the use of alternative energy sources. This includes investments in electric charging networks and other forms of alternative fuel. In addition to technological solutions, the Green Deal emphasizes the importance of changes in citizen behavior.

Raising Awareness About Sustainable Transportation

Increasing awareness about sustainable transportation and providing information on alternative options are critical to achieving the goals set forth in environmental initiatives. Educating and informing citizens about sustainable mobility will be essential for reducing dependence on fossil fuel-powered vehicles.

A notable example is the city of Luxembourg, which has offered free public transportation for several years. Patrick Goldschmit, the alderman for mobility in Luxembourg City, emphasizes to “Green Europe” that buses in the city are utilized by approximately 500,000 to 600,000 passengers weekly, totaling over 40 million passengers annually.

The city plans to electrify its entire bus fleet within the next two years. For over a decade, they have been analyzing air quality at various locations throughout the city, monitoring nitrogen dioxide and carbon dioxide emissions. They have concluded that after the introduction of electric vehicles, primarily buses, air quality has significantly improved.

In the coming years, European governments are expected to implement various measures that will contribute to achieving the objectives of the European Green Deal. Innovations such as autonomous vehicles, increased public transport usage, and the creation of pedestrian zones in urban areas are anticipated to bring about lasting changes. The adoption of such measures could result not only in emission reductions but also in an improved quality of life in urban environments and better preservation of biodiversity in cities and large towns.

The European Green Deal is not only an ecological initiative; it represents a vision for a future where sustainability and quality of life are priorities. Transforming the transportation sector is a crucial step in that process. Through policies encouraging sustainable transportation modes, changes in citizen behavior, and innovations, it is possible to build a cleaner and more sustainable planet. Serbia is also contributing to this vision with its efforts to modernize transportation infrastructure and align more closely with European standards.

Traffic in Serbia

Transportation in Serbia predominantly relies on road traffic, with approximately 76% of all freight and 82% of passenger traffic carried out by road. According to data from the Statistical Office of the Republic of Serbia, in 2022, there were about 1.85 million registered passenger vehicles in the country. Unfortunately, Serbia’s vehicle fleet is aging, with more than 70% of cars being over ten years old, which contributes to higher emissions and greater environmental stress.

One of the most pressing issues is air pollution, significantly exacerbated by road transport. The air quality in Belgrade, the capital, is among the poorest in Europe.

Rail transport in Serbia has long been neglected compared with road transport. With approximately 33% of freight and 3% of passenger traffic utilizing railways, there is ample room for modernization. Serbia has been in discussions regarding substantial investments in railway infrastructure, estimated at around €1.5 billion, with a significant focus on rehabilitating existing lines and introducing modern rolling stock.

The EU's backing for Serbia's railway projects is crucial, especially in restructuring and enhancing safety protocols. Future modernization plans aim to improve connectivity and efficiency across the Balkans, integrating Serbia more effectively into the wider European transport network.

Development of Infrastructure and Improvement of Travel and Transport Conditions in Serbia

The development of infrastructure and the improvement of travel and transport conditions in Serbia are key priorities for sustainable economic growth and integration into European trends.

As a candidate country for EU membership, Serbia recognizes the need to modernize its transport system to increase competitiveness and improve the quality of life for its citizens.

Increasing efficiency and modernizing transport infrastructure can have a significant positive impact on the environment. The transport of passengers and goods by rail and the promotion of public transport use can reduce harmful gas emissions and air pollution. Moreover, greater availability of rail transport and improved travel conditions can lead to changes in citizens' habits. Encouraging the use of trains instead of cars can result in reduced traffic in cities, thereby improving living conditions and reducing pollution.

The introduction of modern trains and the improvement of the railway network can significantly influence citizens' habits. In a survey conducted by the Institute of Economic Research, more than 60% of respondents expressed their willingness to use rail if travel conditions were improved[9](2022). Increasing the efficiency, comfort, and scheduling of trains can significantly change travel approaches and reduce car traffic. Educating citizens on the environmental benefits of using railways will also play an important role.

In Serbia, educating citizens can significantly contribute to reducing air pollution, which is one of the biggest problems in urban areas, Belgrade and Novi Sad.

The Role of Citizen Education in Raising Awareness of Benefits

The role of citizen education in raising awareness of these benefits is invaluable. Without sufficient information about the impact of their decisions on the environment, citizens often fail to understand the importance of transitioning from personal vehicles to public transportation. Educational programs can encompass various approaches, including workshops, informational brochures, social media campaigns, and collaboration with schools and local communities.

For instance, resently many project have been implemented which promote environmentally sustainable modes of transport and reduce car usage by educating and sensibilizing citizens about the efficiency of public transportation.When people recognize the personal benefits of using public transport,

9 Institute for Economic Research 2022.

such as saving money and time spent on parking, they are more likely to engage and become part of the solution.

Given the numerous challenges faced by public transportation in Serbia, such as poor infrastructure, outdated vehicles, and insufficiently regular services, citizen education should go hand in hand with improving the system. Citizens need to be aware not only of the environmental benefits of public transportation but also of its practical advantages. Only through a prolonged education process can prejudices be overcome and a habit of using public transport established.

As a society, we must commit to broad educational campaigns and engage all relevant stakeholders to ensure that public transportation becomes the primary and preferred option for all citizens of Serbia.

Networking with European Transport Systems

Networking with European transport systems is becoming increasingly important for Serbia. This integration is crucial not only for economic benefits but also for aligning with European standards regarding safety, quality, and environmental protection.

Serbia's transport network is characterized by its strategic geographical location in Southeast Europe, serving as a vital link between Western and Eastern Europe. The country is enriched with a combination of road, rail, river, and air transport systems, yet it has faced challenges regarding infrastructure development and modernization.

To enhance its transport network and strengthen ties with European systems, Serbia has embarked on several key initiatives:

1. ***EU Funding and Technical Assistance***
   Serbia has been engaged in various EU-funded projects aimed at improving transport infrastructure and services. This includes the Connecting Europe Facility (CEF) and other grants that facilitate modernization efforts.

2. ***Bilateral Agreements***
   Serbia has entered into agreements with neighboring countries like Hungary, Romania, and Croatia to enhance cross-border transport cooperation. These agreements facilitate smoother customs procedures, reducing delays and promoting trade.

3. ***Regional Cooperation***
   Initiatives such as the Western Balkans Transport Community aim to harmonize transport regulations and standards among the participating countries, fostering regional integration and connectivity with the EU.

4. ***Public-Private Partnerships (PPP)***
   The Serbian government has increasingly recognized the importance of engaging the private sector in infrastructure development through PPPs. This strategy is expected to accelerate projects and introduce innovative solutions in transport management.

The future of Serbia's networking with European transport systems appears promising as the country continues its journey towards EU integration. Increasing economic cooperation, bolstered by an improved transport network, can facilitate trade and attract foreign investment. Enhanced connectivity will

not only benefit Serbia's economy but will also allow it to play a vital role in the EU's broader transport strategy, contributing to regional stability and growth. As Serbia invests in modernization, embraces sustainable practices, and fosters collaboration with European partners, it is poised to make significant strides in networking with European transport systems.

Sustainable Development Strategy Commitment
Serbia has committed to implementing a Sustainable Development Strategy, which includes reducing CO2 emissions in transportation. It is expected that, through connections with European networks, there will be increased usage of trains and public transport, thereby reducing dependence on passenger cars.

Currently, Serbia is implementing a range of strategic projects aimed at improving transportation infrastructure. Among these are the modernization of railway lines, the construction of expressways, and the enhancement of urban transport systems.

For instance, the "Serbia 2025" project, which involves investments totaling approximately 8 billion euros, focuses on the renovation of railway and road infrastructure. The Ministry of Construction, Transportation, and Infrastructure plans to modernize over 1,000 kilometers of railway by 2025, which will reduce travel time and increase safety. Furthermore, the construction projects for the new railway lines linking Belgrade–Budapest and Belgrade–Niš are crucial not only for Serbia but will also enhance regional connectivity.

Belgrade-Budapest Railway

The construction of the high-speed railway line from Belgrade to Budapest is one of the Serbian Government's priorities and is part of a broader plan to modernize the railways in the Balkans and connect to European railway networks. This project, which is largely supported
by China, has always been in the spotlight due to its strategic importance. The railway will enable faster and more efficient transportation of passengers and goods between the two capitals. This project is expected to reduce travel time between Belgrade and Budapest to under three hours, thereby enhancing the business and tourism potential of the region. Additionally, the completion of this project will positively impact sustainable mobility by reducing CO2 emissions during travel.

Belgrade-Niš Railway

Another significant infrastructure project is the construction of the Belgrade-Niš railway line, which will considerably improve rail transport within Serbia. This line will connect Belgrade and Niš, the capital and an important economic center, providing faster access to central and southern Serbia, while also enhancing regional connectivity with neighboring countries.

This project has been actively pursued for several years, with substantial support from European funds. The development of railway infrastructure, such as the Belgrade-Niš line, can be crucial for economic advancement, job creation, and raising living standards for citizens.

The completion of this railway is expected to boost freight transport, thereby further reducing the need for road transportation and positively impacting the environment.

Potential of the Belgrade-Budapest and Belgrade-Niš Rail Projects

The construction projects for the Belgrade-Budapest and Belgrade-Niš railways have the potential to significantly improve railway traffic in Serbia, with far-reaching positive consequences for the economy, sustainability, and the quality of life for citizens. The development of these railway lines not only strengthens regional connectivity but also contributes to the reduction of harmful gas emissions and promotes a more environmentally friendly mode of transport.

The World Bank has recognized the importance of these projects and has invested approximately 200 million dollars into the development of railway and road infrastructure in Serbia, alongside other international partners such as the European Investment Bank and the Chinese Development Bank. The objective of these investments is to establish a modern transportation system that will allow for faster, more efficient, and environmentally friendly transport services.

Conclusion

Improving transportation infrastructure in Serbia is a multi-layered process that requires a strategic approach, investment, and collaboration with international organizations. The development of the railway sector and the adoption of European standards can bring numerous ecological and economic benefits. The future of transport in Serbia lies in sustainable solutions that will enhance the quality of life for citizens and mitigate negative environmental impacts. With proper implementation, Serbia can become a model of a sustainable transportation system in the region.

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Reflecting My Vision in Reporting Climate Change

Abstract:

Climate change is an existential threat that demands urgent and informed reporting. In Africa, the consequences are particularly severe, requiring journalists to adopt a responsible and impactful approach to climate issues. As I engaged with the “Reporting Climate Change” course, I realised that effective journalism must do more than present facts; it should advocate for solutions and empower communities.

As the clock ticks down on our planet’s future, the conversation around climate change has reached a fever pitch. At the heart of this discourse lies the pivotal role of journalism, which must evolve from merely chronicling environmental woes to shaping narratives that inspire action and instigate change. This research seeks to amplify the voices of those most affected by climate change— particularly in Africa—highlighting how climate journalism can transcend traditional boundaries to foster resilience, innovation, and community empowerment.

Grounded in a robust theoretical framework that intertwines climate science, social justice, and media studies, this exploration delves into the nuances of responsible reporting. It draws on frameworks such as the Social Construction of Climate Change and Solutions Journalism, emphasizing that effective reporting is not just about presenting facts but also about constructing narratives that resonate with

Keywords:

Climate change, Journalism, Advocacy, Resilience, Solutions

the lived experiences of diverse populations. By situating my research within these established theoretical arenas, I aim to demonstrate how informed, empathetic journalism can catalyse public discourse and influence policy, ultimately paving the way for a more sustainable and equitable future.

In an era where misinformation abounds and the stakes are higher than ever, my research aspires to address this gap in climate reporting. By integrating local knowledge with scientific rigour and reframing challenges as opportunities, I believe we can cultivate a new brand of journalism—one that not only informs but empowers, inspires, and ignites action. Through a thorough examination of the methodologies and insights gleaned from the Reporting Climate Change program, this work offers a fresh perspective on how we can redefine climate narratives to build a resilient and informed global community.

1. Defining the Problem: The Climate Reporting Dilemma in Africa

As the clock ticks inexorably towards environmental tipping points, the urgency of climate change reporting has never been more pronounced, especially in vulnerable regions like Africa. Here lies the crux of the problem: while the impacts of climate change resonate through every facet of life— from agriculture to health, from migration to infrastructure—journalistic coverage often remains fragmented, reactive, and sensationalized. This gap is not just a journalistic failing; it is a disservice to the public and policymakers who rely on accurate information to shape critical decisions.

The challenge intensifies when we consider the complexities of the African context. Here, the realities of climate change intertwine with socio-economic challenges, cultural narratives, and geopolitical dynamics. Journalists are tasked with not just reporting the facts about rising temperatures or erratic weather patterns but translating these scientific concepts into relatable narratives that empower communities to advocate for sustainability and adaptation.

However, many media outlets still struggle to move beyond catastrophic headlines to highlight innovative solutions and grass-roots initiatives. This is where effective climate journalism is needed

most-to illuminate pathways for hope, resilience, and actionable change. The absence of such narratives perpetuates a cycle of despair, undermining public motivation to engage with climate issues critically.

Thus, the pressing issue is clear: how can journalists reshape their approach to transforming climate reporting into an insightful, opportunity-focused dialogue that resonates with audiences? The answer lies in education and collaboration, as equipped professionals who understand the nuances of climate impact can illuminate the interconnectedness of issues and offer comprehensive, accurate, and engaging coverage that not only informs but inspires action.

In shaping the future of climate journalism in Africa, the focus must shift from mere reporting to advocacy, from doom-laden stories to conversations around innovation and resilience. Only then can we provide the narratives necessary for a sustainable future, highlighting the profound intersection of climate change with human experience. The time for change is now-let's harness the power of storytelling to confront the climate crisis head-on and mobilize communities towards a greener tomorrow:

Defining the Problem
The challenge lies in the misrepresentation and under-reporting of climate change impacts, particularly in vulnerable regions. This misinformation can lead to disengagement and ineffective policy responses. My research aims to explore how journalists can bridge this gap by providing accurate, nuanced, and actionable information.

Background Context
The Reporting Climate Change program offers a structured approach to understanding climate science and the media's role in shaping public discourse. The collaboration between various educational and media organizations highlights the importance of cross-regional insights, specifically tailored for journalists facing diverse challenges.

Theoretical Framework
Incorporating established theories in climate journalism, such as the "Public Understanding of Science" and "Solutions Journalism" frameworks, I aim to situate my understanding within a broader academic context. These frameworks stress the importance of not just reporting climate crises but informing audiences about ongoing solutions and adaptations.

Viewpoint
I believe that climate journalism must transition from merely reporting climate events to actively engaging with communities, fostering resilience, and highlighting innovative solutions. By doing so, journalists can play a critical role in building a more informed, proactive society in the face of climate change.

Review of Relevant Literature on Climate Change Reporting

1. Perspectives on the Problem
The problem of climate change has generated many perspectives across various fields, including environmental science, journalism, politics, and social advocacy. Each domain offers distinct interpretations and insights into climate change reporting and its implications.

- Environmental Science Perspective: From this standpoint, climate change is framed as a scientific reality characterised by rising global temperatures, shifting weather patterns, and biodiversity loss. This perspective often advocates for a strong reliance on empirical evidence and the underlying scientific mechanisms driving climate change.

- Journalistic Perspective: Journalists, especially those specialising in climate reporting, interpret the problem through the lens of communication and public engagement. They argue that effective reporting must bridge the gap between scientific understanding and public perception. This perspective emphasises storytelling, accessibility, and emotional resonance, suggesting that facts alone are insufficient to inspire action or change behaviours related to climate issues.

- Political Perspective: Politically, climate change is viewed as a critical issue of governance, international relations, and public policy. This perspective involves debates on climate justice, policy frameworks, and governmental accountability. It recognizes the inequalities that climate change exacerbates, particularly in regions like Africa, where vulnerable populations face disproportionate risks. Political analyses often critique the role of governments and institutions in contributing to or mitigating climate crises.

- Social Advocacy Perspective: Advocates emphasise the ethical dimensions of climate reporting. They argue for inclusive journalism that gives voice to marginalised communities disproportionately affected by climate change. This perspective prioritizes equity and social justice, asserting that effective climate communication must encompass diverse narratives and empower communities to participate in climate solutions.

2. Critical Examination of Material Read
In examining the literature on climate change reporting, several themes and critiques emerge:

- Effectiveness of Communication: A significant body of literature critiques traditional journalistic approaches for their focus on alarming statistics without contextual analysis. Some studies have shown that mere reporting of doom-and-gloom scenarios can lead to audience desensitisation. Alternatively, literature on “solutions journalism” highlights the importance of portraying not only the challenges but also innovative solutions and community resilience. This more balanced approach can engage audiences more effectively and encourage proactive responses.

- Intersectionality in Reporting: Some scholars stress the need for intersectional approaches in climate reporting. They argue that climate change does not exist in a vacuum; it intersects with issues of race, gender, and economic status. Literature that incorporates these dimensions tends to provide a more comprehensive understanding of the complexities involved in climate change narratives. Critics note that ignoring these intersections often results in oversimplified stories that fail to capture the lived experiences of various communities.

- Local vs. Global Narratives: The tension between local and global perspectives in climate reporting has been a recurring theme in the literature. Some argue that global narratives often overshadow local realities, leading to a disconnect between international discourse and

grassroots experiences. Research indicates that local journalism can play a crucial role in addressing climate issues relevant to specific communities, yet it is often underfunded and undervalued.

- Ethics of Reporting: The ethical implications of climate reporting are also heavily debated. Scholars advocate for a responsible approach that avoids sensationalism while accurately representing the urgency of the climate crisis. The literature highlights the importance of transparency in sourcing information and the need to balance scientific rigour with community perspectives. There is a call for journalists to be mindful of how their narratives can influence public perceptions and behaviours concerning climate action.

In summary, the literature on climate change reporting presents diverse perspectives that underscore the complexity of the issue. Critiques of traditional practices, calls for intersectionality, and an emphasis on ethical journalism highlight the evolving nature of climate communication. As I integrate these insights into my own reporting practices, I remain committed to fostering a nuanced, inclusive, and solutions-oriented approach to climate journalism.

Relevant Data on Climate Change Reporting

1. Global Temperature Rise: According to the Intergovernmental Panel on Climate Change (IPCC), global surface temperatures have increased by approximately 1.1 degrees Celsius since 1850-1900. This data underscores the urgency to address climate change and its implications on various sectors, including agriculture, water supply, and public health.

2. Climate Vulnerability in Africa: A report by the United Nations Environment Programme (UNEP) highlighted that Africa is among the most vulnerable regions to the impacts of climate change, with projections showing that food production could decline by up to 50% in some areas by 2025 due to climate-related factors. This reinforces the critical need for targeted climate journalism that addresses these specific vulnerabilities.

3. Public Perception and Awareness: A Pew Research Center survey indicates that nearly 70% of respondents in various global regions consider climate change a major threat. However, awareness differs significantly across demographics and regions, emphasizing the role of journalists in shaping public understanding of climate issues.

4. Successes of Solutions Journalism: The Solutions Journalism Network reported that articles focusing on solutions to climate change do not diminish the seriousness of the issue; instead, they improve reader engagement and inspire action. Stories that highlight success stories and local adaptations can empower communities and motivate policy changes.

Interpretation of the Data

The data collectively illustrates the multifaceted nature of climate change and highlights the pressing need for informed responsible journalism. The rising global temperatures and the significant impact on agriculture in Africa predominantly reflect the urgency for adaptive strategies and informed discourse. The varying levels of public perception call for enhanced efforts to improve climate literacy through nuanced reporting that goes beyond mere fact-sharing.

This aligns with the theoretical framework introduced earlier in the essay, which emphasizes the role of journalism as a tool for advocacy and education. The findings support the notion that climate journalism must pivot towards not only reporting crises but also framing climate discussions around opportunities for innovation and adaptation, particularly in vulnerable regions.

Synthesis of Data and Theories

The evidence gathered from various credible sources supports the proposition that climate change reporting, especially in regions like Africa, must evolve to address the intersectionality of climate issues with social, economic, and political dynamics.

1. The Intersectionality of Stories: By recognising climate change as a cross-cutting issue, the insights highlight how journalism can capture the interconnectedness of various crises and human experiences. This bridges the theories of systems thinking in environmental journalism, suggesting that effective reporting should interlink various dimensions of climate impact, which can lead to more comprehensive public discourse.

2. Credibility and Local Voices: The emphasis on sourcing diverse voices and credible data emphasises a theoretical underpinning of participatory journalism. This approach not only enhances the authenticity of climate narratives but also aligns with the ethics of inclusive reporting—where marginalised voices in the climate conversation are amplified.

3. Framing for Action: The concept of “framing climate as an opportunity” suggests a paradigm shift that aligns with the principles of solutions journalism. This frame reframes the narrative from one of despair to one of possibility, encouraging proactive engagement from the public and stakeholders alike.

In summary, the synthesis of data and theoretical frameworks supports a transformative approach to climate change journalism. It underscores the necessity for responsible storytelling that informs, engages, and empowers, ultimately leading to a more sustainable future rooted in collaboration and community action.

To effectively refute the major view on climate change journalism, which often portrays a predominantly pessimistic narrative centred on doom and despair, it's important to emphasize several critical reasons why this perspective is less acceptable compared to the more balanced and opportunity-focused view I am promoting.

Examples Of Successful Climate Journalism Case Studies from Africa

1. The Guardian's "Africa's Climate" Series: This series highlights the impact of climate change across various African countries, focusing on communities that have successfully implemented sustainable practices. For example, the article on farmers in Ethiopia showcases how local agricultural adaptations, like drought-resistant crops and water conservation techniques, have led to increased resilience and food security despite climate challenges.

2. Ghana's "The Fourth Estate" Initiative: This project emphasizes solutions journalism by training journalists to report on local climate initiatives. One highlighted case study features a community in Northern Ghana that has successfully adopted solar energy for cooking and lighting, showcasing the benefits of renewable energy while encouraging broader adoption across the region.

3. Kenya's "Climate News Network": This platform aims to produce in-depth climate reporting while emphasizing local voices and solutions. A notable article reported how coastal communities in Kenya are implementing mangrove restoration as a natural defence against rising sea levels. By providing insight into the tangible benefits of such initiatives, journalism not only educates the public but also inspires communities to engage in similar projects.

4. South African Environmental Journalism Projects: The "Media in the Era of Climate Change" initiative trains South African journalists to effectively cover climate issues. A successful case involved a report on Cape Town's water crisis, detailing the local government's innovative water catchment systems and community-led conservation efforts. This reporting framed the water crisis not just as a challenge but as an opportunity for advocacy and local action.

5. **"Sustainable Development Goals" (SDGs)** Reporting in Tanzania: Journalists in Tanzania

have showcased practices that meet multiple SDGs while addressing climate change. For instance, covering community-led reforestation projects that improve biodiversity and provide livelihoods exemplifies responsible reporting that highlights both challenges and solutions.

Africa Climate Change Journalism Associations

Pan African Media Alliance for Climate Change (PAMACC)

An African association of environmental journalists. The alliance was formed in 2013 as a PACJA and has been operational since. The main objective of PAMACC is to provide support to journalists reporting on climate change. It is run by regional coordinators who continue to encourage journalists to set up national bodies that can be responsible for running the initiative more closely and achieving the alliance's mandate. Creating and changing the climate change narrative using the African lens will provide a lot of insight into achieving less emission of natural gases and other mitigating aspects of climate change. It will provide a voice to the indigenous people, women and most especially the youth who are not only creative but also passionate and energetic.

Oxpeckers

The Oxpeckers Center for Investigative Environmental Journalism is Africa's first journalistic investigation unit focusing on environmental issues. The Center combines traditional investigative reporting with data analysis and geo-mapping tools to expose eco-offences and track organised criminal syndicates.

The African Network of Environmental Journalists (ANEJ)

The African Network of Environmental Journalists (ANEJ) is an organisation that seeks to promote public understanding of environmental issues in Africa by improving the quality, accuracy, and intensity of environmental reporting. The organisation, whose motto is "the voice of the African environment", aims to increase the coverage of environmental issues in the media in Africa and to enhance the capacity of African journalists to report on environmental issues through workshops, networking, information sharing, and institutional development.

Power Shift Africa

Power Shift Africa (PSA) and partners hosted the second African journalists training on climate change just days before the Africa Climate Summit, seeking to entrench African voices in the global climate discourse.

Jamlab

Jamlab, short for the Journalism and Media Lab, is a project of the Wits Centre for Journalism. Its work aims to support more and better innovation in journalism and media in Africa.

Africa: national associations

- Benin: Association des Journalistes et Communicateurs Scientifiques du Benin
- Burkina Faso: Association des Journalistes et Communicateurs scientifiques du Burkina Faso

- Cameroon: SciLife-Cameroon's Association of Science Journalists and Communicators
- Democratic Republic of Congo: Réseau National des Journalistes Congolais Pour l'Environnement
- Ethiopia: Ethiopian Environment Journalists Association
- Mozambique: Rede de Jornalistas Ambientais de Mozambique
- Niger: Association des Journalistes Scientifiques du Niger Nigeria: Nigeria Association of Science Journalists
- Rwanda: Rwanda Association of Science Journalists
- Sierra Leone: Federation of Environmental Journalists in Sierra Leone
- Sierra Leone: The Sierra Leone Environmental Journalists Association
- Sierra Leone: Union of Environmental Journalists
- South Africa: South African Science Journalists Association
- Sudan: Sudanese Environmental Journalists Association
- Sudan: Sudanese Society for Scientists and Environmental Journalists
- Tanzania: Journalists Environmental Association of Tanzania
- Togo: Science Journalists and Communicators of Togo
- Tunisia: Tunisia Environment Reporting Network
- Uganda: Uganda Science Journalists Association
- Zambia: African Network of Environmental Journalists - Zambia Chapter
- Zimbabwe: Zimbabwe Environmental Journalists Association

1. Narrowing the Narrative Limits Engagement

The dominant perspective often frames climate change as an insurmountable crisis, thereby fostering a sense of helplessness among audiences. This approach can result in disengagement from the issue, as people may feel overwhelmed and decide that their individual actions will not result in meaningful change. In contrast, by adopting a more positive and opportunity-focused narrative, I aim to inspire action and innovation, highlighting efforts and solutions that communities are spearheading. This empowers the audience, encouraging them to be part of the solution rather than passive observers of catastrophe.

2. Complexity of Climate Change Misrepresented

The typical narrative tends to oversimplify climate change into a binary of impending doom versus business as usual. This fails to acknowledge the diverse ways in which communities adapt, resist, and innovate in the face of climate challenges. By emphasising the nuanced realities and the adaptive strategies being employed—especially in contexts like Africa—I argue for a more comprehensive portrayal that reflects the complexities of climate issues. This approach invites a deeper conversation about resilience, sustainability, and the potential for positive change, rather than merely highlighting negative outcomes.

3. Lack of Inclusivity in Perspectives

The major view often prioritizes scientific data and global reports while sidelining local voices and experiences. This tends to perpetuate a top-down narrative that may not resonate with those most affected by climate change. My proposed view seeks to incorporate a wider array of perspectives, including those of local communities, indigenous peoples, and grassroots activists. By amplifying these voices, we gain valuable insights into on-the-ground realities and community-driven solutions, thus enriching the overall discourse on climate change.

4. Influence on Policy and Action

Focusing on doom can also impede effective policy advocacy. Policymakers may be more inclined to ignore or dismiss climate reports that evoke despair rather than hope. Conversely, highlighting opportunities and successful initiatives can motivate policymakers to enact supportive legislation, incentivising sustainable practices and innovation. This proactive approach is essential for engaging stakeholders at all levels—from local governments to international agencies—and promoting a collaborative effort toward climate action.

Identifying Weaknesses in My Data

While I advocate for a more balanced perspective, I acknowledge certain gaps and weaknesses in my current data:

- Incomplete Regional Coverage: My data may lack comprehensive coverage of all regions, particularly under-represented communities affected by climate change. This could lead to a skewed understanding of how diverse cultures and environments respond to climate issues.

- Limited Longitudinal Studies: Much of the data I rely on may not include long-term studies that capture the evolving impacts of climate change and the effectiveness of various adaptation measures over time.

- Potential Bias in Sources: There might be an over-reliance on select sources that emphasize success stories, which could detract from a full understanding of ongoing challenges. This risk of bias underscores the need for a more exhaustive collection of data that includes both success and struggle.

How Journalists Can Effectively Engage With Local Contexts and Cultures

Journalists can effectively engage with local contexts and cultures by employing several strategies that ensure their reporting resonates with the communities affected by climate change. Here are some key approaches:

1. Building Relationships with Local Communities: Establishing trust is crucial. Journalists should immerse themselves in the communities they are reporting on by attending local events, engaging with

community leaders, and understanding local customs and values. This helps in cultivating relationships that foster open communication and mutual respect.

2. Listening and Inclusivity: Active listening is essential to understand the unique perspectives, experiences, and concerns of community members. Journalists should prioritise inclusivity by featuring voices from diverse demographics—such as women, youth, and marginalised groups— ensuring a variety of viewpoints are represented in their coverage.

3. Cultural Sensitivity: Understanding cultural norms and narratives is vital in shaping how stories are told. Journalists should approach local traditions, beliefs, and languages with sensitivity and respect. They can incorporate local idioms, metaphors, or storytelling techniques that resonate with audiences to enhance relatability.

4. Highlighting Local Knowledge and Solutions: Communities often have valuable indigenous knowledge and practices that can inform climate adaptation strategies. Journalists should actively seek out and showcase these local solutions, providing platforms for community-led initiatives, which can empower residents and inspire broader engagement.

5. Collaborative Reporting: Partnering with local journalists or media organizations can enrich storytelling by incorporating local insights and nuances. Collaboration allows for a deeper understanding of regional issues and fosters a more authentic narrative that reflects the community's realities.

6. Contextualizing Climate Change: Journalists should relate climate issues to local priorities, drawing connections to agriculture, health, economy, and security. By framing climate change within the broader context of daily life, reporters can make it more relevant and urgent for the community.

7. Utilising Local Languages: When possible, reporting in local languages can significantly enhance accessibility and engagement. This practice not only makes information more comprehensible but also shows respect for cultural identity and heritage.

8. Feedback Mechanisms: Establishing channels for community feedback on reporting can help journalists refine their approach and ensure ongoing relevance. This can include community forums, social media interactions, or surveys to gauge public response and engagement with the stories being told.

9. Education and Capacity Building: Journalists can contribute to the community's understanding of climate change by organising workshops, seminars, or informational campaigns. Increasing local awareness and capacity to engage with climate issues empowers communities and ensures they are active participants in the narrative.

10. Long-term Engagement: Rather than treating climate stories as one-off pieces, journalists should cultivate long-term relationships with the communities they cover. This entails following up on issues, revisiting communities, and continuing to tell their stories as they evolve over time.

By embedding these strategies into their reporting practice, journalists can create narratives that not only inform but also resonate deeply with local communities, driving advocacy and fostering resilience in the face of climate change challenges.

Solutions and Grassroots Initiatives

Successful climate journalism has effectively showcased innovative solutions and grassroots initiatives in several ways. Here are some specific examples:

1. Community-Based Adaptation Initiatives: Articles highlighting local organizations in Africa that implement community-based adaptation projects, such as rainwater harvesting systems in rural villages or drought-resistant farming techniques. For instance, the work of the Green Belt Movement in Kenya, founded by Wangari Maathai, has been reported to show how tree planting and community empowerment can combat deforestation and soil erosion, improving both local ecosystems and livelihoods.

2. Renewable Energy Projects: Coverage of solar energy projects in sub-Saharan Africa, such as the Solar Sister initiative, which empowers women entrepreneurs to distribute solar products. Journalists have highlighted how these initiatives not only provide clean energy but also promote social and economic development, showcasing a sustainable path forward.

3. Sustainable Agriculture Practices: Reporting on organisations like the Permaculture Research Institute, which demonstrates sustainable farming techniques that enhance food security while rebuilding local ecosystems. Journalists can spotlight success stories from farmers who adopt these methods, illustrating how they combat climate impacts while improving yield.

4. Climate Resilience in Urban Planning: Stories on cities like Cape Town that have implemented water conservation measures in response to severe droughts. Journalists can showcase how investments in green infrastructure, such as permeable pavements and urban gardens, not only address climate risks but also enhance urban livability.

5. Youth-Led Movements: Coverage of youth climate movements, such as Fridays for Future or local equivalents in Africa, that advocate for policy changes and raise awareness about sustainability. Highlighting the voices of young activists who engage in tree planting, cleanup efforts, or awareness campaigns illustrates the power of grassroots movements in driving change.

6. Innovative Technologies: Reporting on startups and tech companies developing climate-friendly technologies, such as biodegradable packaging or carbon capture systems. By showcasing these innovations, journalists can illustrate pathways for industry and economy to align with sustainability goals.

7. Policy Advocacy Success Stories: Articles documenting the passage of legislation in various African nations aimed at addressing climate change, such as renewable energy targets or conservation efforts. Reporting on the public campaigns that led to these changes demonstrates the efficacy of informed advocacy and civic engagement.

By focusing on these solutions, climate journalism can inspire hope and motivate communities to engage with climate issues constructively, moving beyond a narrative of despair toward a future filled with possibilities and innovation.

Education and Collaboration: Strategies for Implementation

To build a resilient framework for effective climate journalism in Africa, the following strategies for education and collaboration can be implemented:

A. Educational Programs

1. Journalism Training Workshops
- Target Audience: Aspiring and current journalists, media students, and community leaders.
- Focus Areas:
- Understanding climate science and its socio-economic impacts.
    - Skills in solutions journalism and narrative construction.
    - Ethical considerations in climate reporting.
- Implementation: Partner with universities and NGOs to develop and deliver workshops.

2. Online Courses and Resources
- Platforms: Utilise existing e-learning platforms to reach a wider audience.
- Content:
    - Modules on climate science basics, effective storytelling, and advocacy strategies.
    - Case studies showcasing successful climate journalism initiatives.
- Outcome: Create a repository of knowledge accessible to journalists across Africa.

3. Mentorship Programs
- Structure: Pair experienced journalists with newcomers in the field.
- Activities:
    - Hands-on reporting assignments focused on climate issues.
    - Regular feedback sessions and collaborative project development.
- Goal: Foster a culture of learning and shared knowledge in climate reporting.

B. Collaborative Frameworks

1. Partnerships with Environmental Organizations
-Objective: Cohesively bring together the voices of scientists, activists, and journalists.
- Activities:
  - Joint reporting projects that highlight community-led climate initiatives.
  - Funded research projects to generate data for robust storytelling.
- Benefit: Ensure that journalism is informed by evidence and enriched by diverse perspectives.

2. Network of Climate Journalists
- Formation: Establish regional networks that facilitate communication and resource sharing among climate journalists.
- Functions:
  - Regular meetups, both virtual and in-person, to discuss challenges, share reports, and brainstorm solutions.
  - Collaborative campaigns or special features to cover climate stories from various angles.
-Result: Creates a united front for climate reporting and encourages cross-border journalism efforts.

3. Engagement with Local Communities
- Methodology:
  - Host community forums and listening sessions to gather stories directly from those affected by climate change.
  - Train community members in basic reporting skills to empower local narratives.
- Outcome: Builds trust and provides journalists with authentic content that resonates with audiences.

4. Involvement of Policymakers
- Strategy:
  - Create platforms for dialogue between journalists and policymakers to ensure that media coverage is aligned with policy needs.
  - Facilitate workshops where journalists can get firsthand updates on climate policies and decisions.
- Impact: Strengthens the relevance of journalism in influencing climate-related policies and decisions.

By implementing these educational programs and collaborative frameworks, we can cultivate a new generation of climate journalists in Africa who are not only informed but also empowered to drive conversations and actions surrounding climate change. Together, these strategies will enhance the coherence, relevance, and impact of climate journalism across the continent.

Conclusion

In summary, while the prevailing view on climate change journalism presents several valid concerns, its limitations in creating engagement, misrepresenting complexity, excluding diverse perspecti-

ves, and potentially hindering policy action make it less acceptable. By advocating for a narrative that highlights opportunities, grass-roots innovations, and inclusive perspectives, I aim to contribute to a more effective and empowering discourse on climate change, driving meaningful action in communities and beyond. Recognising the weaknesses in my own data allows me to strive for a more comprehensive and balanced approach in future reporting.

My work in reporting climate change fits into the broader landscape of scientific inquiry and activism aimed at addressing one of the most pressing issues of our time. By integrating insights from scientific research and grass-roots perspectives, my reporting endeavours contribute to a continuum of knowledge dissemination that informs not only public discourse but also policy- making. I see my role as that of a facilitator who bridges the gap between complex scientific information and community understanding, ensuring that the voices of those most affected by climate change are amplified. This aligns with the ongoing efforts of scientists and researchers dedicated to translating their findings into accessible content that inspires action and fosters resilience.

To extend and improve my work, I recognise the importance of collaboration with various stakeholders, including scientists, policymakers, and local communities. By fostering deeper partnerships, I can enhance the rigour of my reports by incorporating more empirical data and expert analysis. Additionally, I aim to refine my storytelling techniques to present climate narratives that are not only informative but also emotionally resonant, thereby mobilising a wider audience towards advocacy and action. Lastly, continuous engagement with emerging technologies and platforms for journalism will allow me to reach diverse audiences more effectively, promoting a shared understanding of climate issues that transcends geographical and cultural boundaries. By committing to these improvements, I hope to contribute meaningfully to the global conversation on climate change and empower communities to engage in the necessary transformations for a sustainable future.

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Sustainable Water Supply and Sanitation Systems in Morocco: Characteristics and Challenges

Abstract:

Morocco is experiencing significant water scarcity, exacerbated by climate change, population growth, and urbanization.

The country's water resources are stretched thin, impacting both agricultural production and daily human consumption. Morocco's National Water Plan aims to combat these issues through infrastructural and policy reforms, yet challenges persist.

Keywords:

Water scarcity, sanitation, Morocco, sustainable development, water management, desalination.

1. Introduction

1.1 Water Scarcity and Sanitation Challenges in Morocco

Morocco is one of the countries most vulnerable to water scarcity due to its arid climate, inconsistent rainfall, and increasing demand on water resources. Water scarcity, compounded by rapid population growth, climate change, and socio-economic challenges, has strained Morocco's water supply and sanitation systems. Annual water availability has dropped below 620 cubic meters per person, pushing Morocco into a category of water stress that requires immediate and sustained attention.

1.2 Morocco's Water Management Efforts

Water scarcity in Morocco is not a new issue; however, in recent years, it has intensified, pushing the country to implement comprehensive strategies for water management. Morocco's National Water Strategy (PNE) and the Green Morocco Plan are significant efforts to increase water security, enhance agricultural productivity, and ensure equitable access to water. The government has outlined the National Strategy for Sustainable Water Management, which focuses on climate adaptation, water conservation, and infrastructure investment. International organizations, including the European Investment Bank (EIB), have supported these initiatives through funding and technical assistance. For example, the Chtouka desalination plant project is a result of these partnerships and aims to provide sustainable water supplies in drought-affected areas of Morocco. This plant produces water for both agricultural and urban needs, helping reduce the region's reliance on groundwater.

1.3 Research in Sustainable Development

This research draws on the sustainable development framework, which emphasizes environmental stewardship, economic efficiency, and social equity. By examining Morocco's approaches and challenges in water and sanitation, this study contributes to the understanding of sustainable water management practices in water-scarce and arid regions.

1.4 Argument

While Morocco has made progress in sustainable water supply and sanitation, it faces ongoing challenges due to climate variability, fragmented governance, and regional disparities. This essay argues that a more integrated approach, involving technological solutions, stronger policy enforcement, and community engagement, is essential to achieving water sustainability in Morocco.

2. Literature Review

2.1 Perspectives on Water Scarcity in Morocco

Multiple studies have explored the water scarcity issue in Morocco from varying perspectives. Researchers have highlighted the significant impact of climate change, arguing that Morocco's climate-sensitive water resources require adaptive and resilient management strategies.

2.2Critiques of Current Water Management Approaches

Although Morocco's National Water Strategy is ambitious, it faces several criticisms. Scholars argue that current strategies are often too infrastructure-focused, with insufficient attention to regulatory frameworks and community

involvement.

3. Data on Morocco's Water and Sanitation Infrastructure

3.1 Current State of Water Infrastructure in Morocco

Morocco's water infrastructure includes over 140 dams, desalination plants, and wastewater treatment facilities. According to the Office National de l'Électricité et de l'Eau Potable (ONEE) , the country's water availability has decreased significantly, from around 2,600 cubic meters per capita in the 1960s to less than 620 cubic meters today. This decline, driven by increased demand, inefficient agricultural practices, and climate impacts, poses a critical challenge to water sustainability. Furthermore, over 25% of Morocco's rural communities still lack adequate sanitation facilities.

4. Linking Data to the Sustainable Development Framework

The data supports the argument that Morocco's reliance on conventional water sources, such as rain-fed reservoirs, is insufficient in the face of climate change. Theoretical frameworks on sustainable development emphasize the importance of diversification and efficiency in resource management. Morocco's increased investment in desalination aligns with these frameworks, providing an alternative water source less dependent on rainfall variability.

5. Evidence Supporting Sustainable Practices in Water Management

The National Water Strategy (PNE) incorporates multiple elements of sustainable development, such as conservation, desalination, and wastewater recycling. The Chtouka desalination plant represents a practical application of sustainable development theories by offering a climate-resilient water source (Dahan & Bouchaou, 2017). Additionally, international funding, such as support from the EIB, demonstrates the importance of collaborative efforts in addressing Morocco's water scarcity.

6. Criticism of Predominant Water Management Approaches

While Morocco's National Water Strategy has prioritized infrastructure and desalination, there is criticism that it lacks adequate attention to regulatory reform and local governance. Critics believe that the current infrastructure-focused approach may lead to short-term gains but fails to address the root causes of water inefficiency and inequitable access.

7. Areas Needing Further Research

The analysis primarily draws on government reports and international publications, which may not fully represent on-the-ground realities, particularly in rural Morocco. Limited availability of region-specific data restricts a more detailed examination of the challenges faced by local communities.

8. Technological Innovations in Water Management

Technological advancements are pivotal in addressing Morocco's water scarcity. One such innovation is the use of artificial intelligence (AI) to monitor and optimize water distribution. AI-driven systems help predict rainfall,

manage reservoir levels, and reduce inefficiencies, particularly in agriculture. Solar desalination also plays a vital role. The Noor Ouarzazate Solar Complex is exploring integration with desalination systems to ensure a renewable water supply for drought-prone regions15.

Conclusion

This research contributes to the broader discussion on sustainable water management by providing insights into Morocco's adaptive strategies in response to water scarcity. Morocco has demonstrated progress in implementing solutions such as desalination plants, renewable energy integration, and improved water infrastructure. However, challenges remain, particularly in addressing governance gaps and ensuring equitable access to water resources for rural and underserved communities.

Future studies should incorporate field research to provide a more granular view of the specific challenges and responses within Morocco's diverse regions. This approach could help uncover the socio-economic impacts of water and sanitation policies, particularly for vulnerable populations. Further integration of community-based water management initiatives and innovative technologies like artificial intelligence (AI) and smart water grids is crucial to achieving long-term sustainability.

By embracing a holistic approach that includes policy reform, technological innovation, and community engagement, Morocco can better navigate the challenges of water scarcity while aligning with global sustainable development goal.

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Addressing Climate Refugees and Conflict: A Global Response

Abstract:

Climate change is displacing millions, fueling conflicts, and threatening global security. This paper examines the intersection of climate refugees and conflict, arguing for a coordinated international response. It analyzes existing frameworks, scientific evidence, and data to propose effective strategies for mitigating climate-related displacement and conflict.

Keywords:

Climate Refugees, Displacement Vulnerability, Resilience, Adaptation

Introduction

Climate change is increasingly recognized as a driver of human migration and conflict. Rising temperatures, sea-level rise, and extreme weather events are displacing communities, straining resources, and exacerbating social tensions. The international community must address this growing crisis.

Argument

The international community must adopt a comprehensive approach to address climate refugees and conflict, recognizing the intricate relationships between climate change, human migration, and conflict.

Climate Change and Human Migration

Scientific evidence overwhelmingly links climate change to human migration. The Intergovernmental Panel on Climate Change (IPCC) Reports and climate models demonstrate the correlation.

Consequently, Climate change is projected to increase displacement and migration in various regions, particularly in areas with low-lying coastal zones, deltas, and island nations. The IPCC report highlights the potential impacts of climate change on human migration and displacement, emphasizing the vulnerability of certain regions and populations. The key findings from this report suggests that climate change will increase displacement and migration due to the increase in Sea level rise and costal erosion, increased frequency and severity of extreme weather events, changes in precipitation patterns and water scarcity, and loss of livelihoods and decreased food security.

The most vulnerable regions projected to be affected are low lying coastal areas for example, Bangladesh and Vietnam. The small island nations, the Mekong and Nile delta regions as well as Sub-Saharan Africa.

Migration patterns are projected to be mostly internal and within country. Meaning that there will be an increase of people leaving rural communities into urban areas as well as crossing borders into neighboring countries where facilities are favorable or available.

This upsurge of migration will however, likely to produce shocks that will instigate impacts on social and economic activities, and evoke human rights concerns. The strains on local infrastructure and resources has potential to unbridle conflict and social unrest.

The IPCC's Fifth Assessment Report1 observes and emphasizes the urgent need for climate action to mitigate the impacts of climate change on human migration and displacement, while recommending adaptation and resilience strategies, the development of climate – resilient infrastructure, at the same time, agitating for social protection programs and international cooperation and climate governance.

With various models showing an increase in migration due to climate change. Models CMIP5 (Coupled Model Intercomparison Project Phase 5). A broader awareness of climate change and its interconnected factors should simulate various climate change scenarios and their impacts on migration and climate refugees "Climate change and human migration" (Climatic Change, 2018)2 - to counter a growing population of climate induced migration and conflicts.

Breakdown of displacement

Data derived from UNHCR shows that displacement is rising at alarming rates. At the end of 2023, an estimated 117.3 million3 people worldwide were forcibly displaced due to persecution, conflict, violence, human rights violations, and events seriously disturbing the public order. This number has been increasing for 12 consecutive years, with 8.8 million people displaced in 2023 alone.

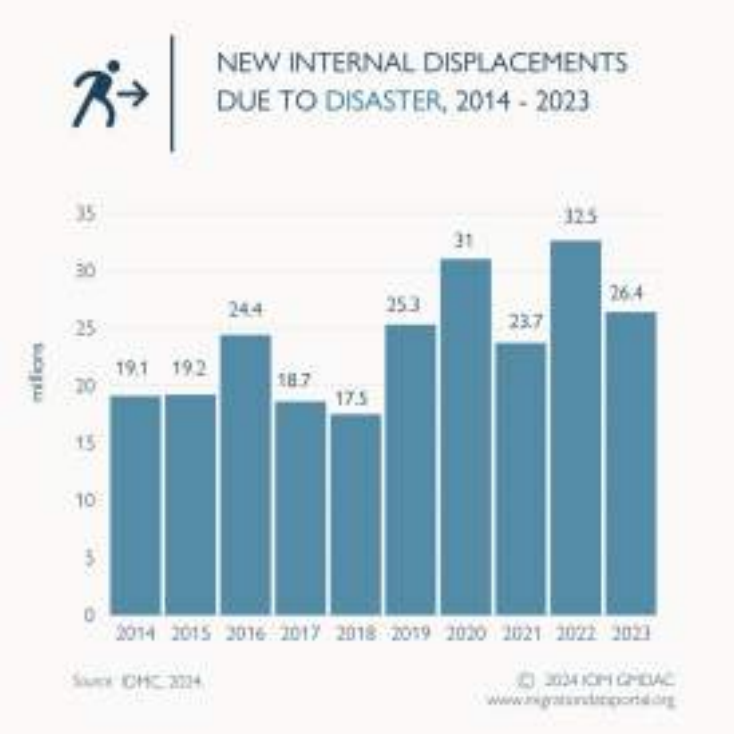

Fig 1. Showing IDPs from 2014-2023

The global refugee population in the year 2023 is said to have increased by 7% to reach 43.4 million. This figure includes 31.6 million refugees and people in a refugee-like situation, 5.8 million other people in need of international protection under UNHCR's mandate, and 6 million Palestinian refugees under UNRWA's mandate.

A further 68.3 million remained Internally Displaced People (IDPs) due to conflict and violence. The largest IDP populations are in Sudan (9.1 million), Syria (7.2 million), and the Democratic Republic of the Congo (6.7 million).

Regional Displacement

Since 1985, Sudan has barely recovered from the drought and desertification crisis of which caused massive famine in western Sudan and forced thousands to relocate to urban centers. With another shock in 2023, one of the largest humanitarian and displacement crises in the world ensued[1]. Over 5 million children were displaced children. Many live in overcrowded and makeshift camps and settlement, facing inadequate shelter, sanitation, and health care services. Now they face an additional threat of dangerously high temperature, further endangering their lives. With frequent drought, high rainfall variability, and an economy heavily dependent on natural resources. Sudan is one of the most vulnerable countries to climate variability and climate change.

In Myanmar, escalating violence displaced over 1.3 million people within the country in 2023. The conflict in the State of Palestine also led to significant displacement, with up to 1.7 million people (or over 75% of the population) displaced in the Gaza Strip.

Climate Change and Conflict

Climate change exacerbates social, economic and political tensions, increasing the risk of conflict as illustrated by these case studies: Syria is fighting with a host of environmental challenges that range from water scarcity and soil degradation to air pollution and insufficient waste management. The substantial water deficit paints an unembellished picture of resource strain, Scientists says the two factors that affect the occurrence of drought are low rainfall and elevated evaporation levels (https//camegieendowementorg>sada). In Sudan, Darfur region, the mutual relationship of traditional agricultural patterns and nomadic activity was unraveled by climate change. The expansion of the desert southwards every year, and decline in median annual rainfall by 15-30 percent was not seen by the Arab herders and settled farmers'6 before creeping desertification and drought took hold in the region decades before the outbreak of the 2003 war that forced farmers to change their practices.

The impact of climate change was not immediately recognized. As time proceeded, this shift in land use barred herders from traditional grazing areas and eroded the longstanding interdependent relationship between the two groups, gradually leading to bloodshed. Today, Darfur suffers from a heightening climate crisis. The dry seasons are longer and hotter, and the rainy seasons less predictable, jeopardizing life sustaining crop yields and worsening existing food insecurity. In this context, impacts of drought, crop failure, water scarcity, social, and political activities can disrupt lifestyles and livelihoods, and make some places uninhabitable or undesirable- sparking climate migration.

Considering climate migration and conflict is a growing phenomenon and that there are unique vulnerabilities that can be explored, the call to respect human dignity, observance of good governance, respect of rights of individuals, needs to be embraced. Research and studies points out that such attributes have capabilities to induce successful models that can push and reverse the adverse effects of climate induced changes. Researches and Studies by the UN Peace Building Commission has also proffered initiatives to address climate emergencies that are aimed at addressing the complex relationships between climate change, conflict, and peace building. The studies focus on the intersection of climate change, security, and peace, highlighting the need for integrated approaches.

International Response

The international response to climate refugees has been somewhat fragmented, with existing frameworks like UNFCCC, Paris Agreement7, and Refugee Convention having gaps and challenges in addressing this critical issue. While political decisions and climate agreements have made progress to avert conflicts, more is needed to effectively address climate migration and refugees.

Gaps in the current frameworks.

The Refugee Convention established in 19518 doesn't provide protection for climate induced migrants since they don't meet the conventions' criteria. Si-

milarly, the Guiding Principles on internal Displacement aren't legally binding and primarily focus on those displaced within their own country due to natural and human made disasters.

Another challenge has been having to define who qualifies to be climate refugees. The lack of clear definition has hindered the development of effective policies to protect these individuals. while the Paris Agreement sets parameters for a climate neutral world, that focus on mitigation and adaption measures, it does not specifically address the human morality issues.

Again, the lack of binding agreements on climate migration, insufficient funding for climate adaptation and mitigation, limited data and research on climate migration, inadequate protection for climate migrants and refugees and climate change disproportionate impact on vulnerable communities, has created huge gaps and challenges for climate refugees.

Effective Strategies

Research on climate change induced migration in Africa, Asia, and Latin America reveals some alarming trends in these regions. Over 140 million people will be forced to migrate within their countries by 2050 UN9, creating a human crisis that will threaten developmental processes. This is because climate change impacts resources, such as water, crops, fisheries, at the same time the rise of sea levels and storm surges, are making certain areas increasingly inhabitable.

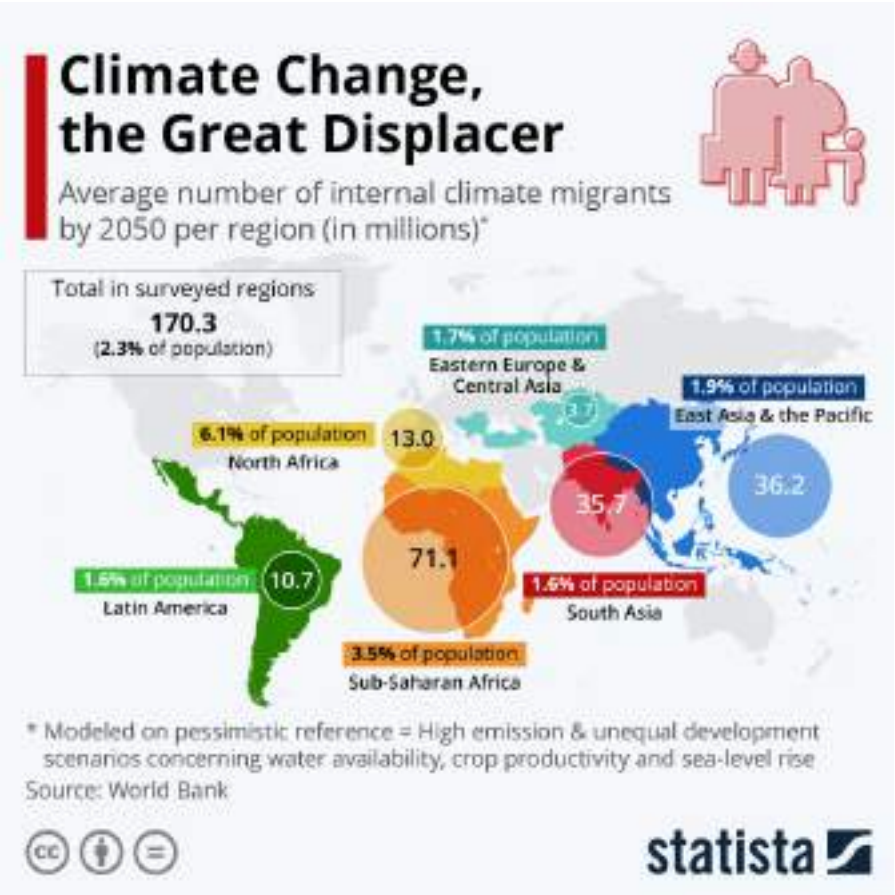

Fig 2. Shoowing climate change as a displacer

Keys findings indicate that in Africa climate change is expected to disproportionately affect Sub-Saharan region with potential migration hotspots identified in countries such as Nigeria, Ghana and Ethiopia. In Asia, the south parts are going to be highly vulnerable, with climate migration is projected to increase in countries like Bangladesh, India and Pakistan.

It means that climate resilient transport infrastructure that includes the design of transport systems that prioritize inclusivity, sustainability and resilient has to be in place. For instance, roads have to be built with climate resilient material and transport planning can incorporate the needs of the disadvantaged groups. Hydro power plants and interconnections can reduce dependence on fossil fuels and mitigate climate change impacts. In agriculture irrigation systems and dams can incorporate climate resilient agriculture and help communities adapt to changing weather patterns.

The world has the capacity to build climate resilient infrastructure, cooperate in disaster risk reduction and raise much needed awareness on climate education.

Conclusion

The international community must prioritize a coordinated response to climate refugees and conflict, addressing root causes, protecting vulnerable populations, and promoting sustainable development.

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