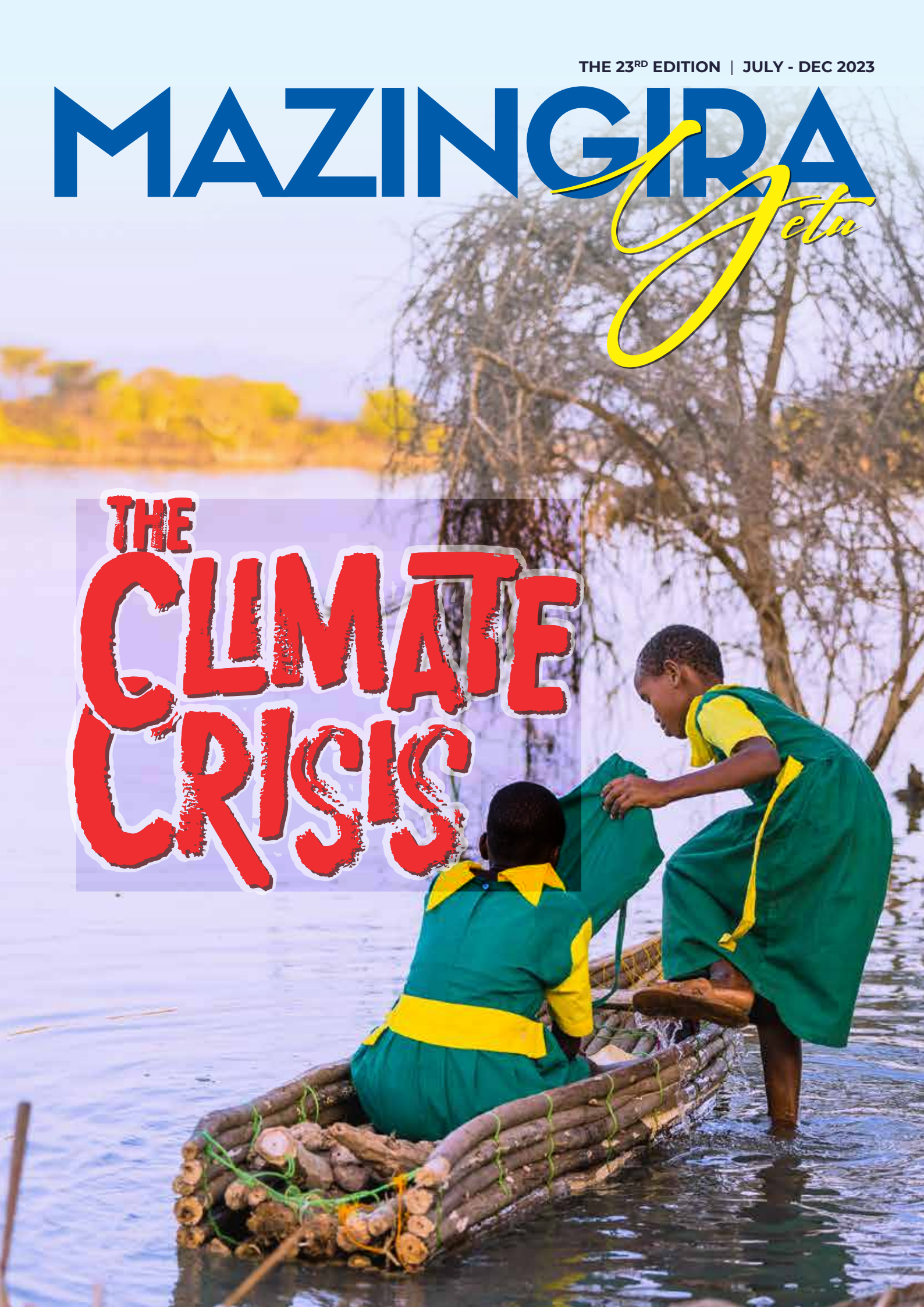


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MAZINGIRA

Setu

THE CLIMATE CRISIS





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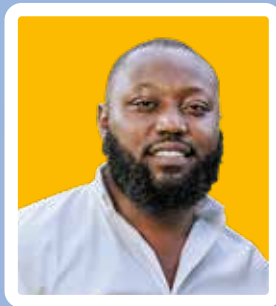
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Cracked up Earth at Lake Olbolosat. by Thuku Kariuki



EDITORS NOTE

David Kaman

Climate change is one of the most defining challenges of our time. In recent years, we've witnessed an increase in extreme climatic events such as accelerated warming, flooding, melting of polar glacial, droughts and hailstorms. The change has been attributed to warming of the global atmosphere arising from enhanced emission of greenhouse gases primarily from human influences. Human mobilization of carbon, nitrogen and phosphorus from earth to atmosphere has increased drastically due to fossil fuel burning, land cover change, use of fertilizers among other causes.

The impact of climate change on biodiversity as well as ecosystem structure and functions/services can be seen around the globe. This has greatly affected communities which directly depend on ecosystems for their livelihoods. This edition highlights the threat to current biomes due to alteration in species phenology and range shifts. We seek to elaborate on adaptation and mitigation for biodiversity conservation under climate change.

Additionally, we examine recent trends as well as projections of future climatic changes and requisite social/policy changes to be implemented. We recognize current efforts both at global and local fronts such as Africa Climate Action Summit and COP 28 all aiming at varying solutions to climate crisis such as energy transition, unlocking climate finance and accelerating green growth. We focus on key tools that are being implemented; Carbon Trading, push to Net Zero, The Global Financing Pact among others.

This edition highlights the knowledge, innovations and practices, and values of Indigenous Peoples and Local Communities and their inclusion/participation in nature conservation, restoration and sustainable use of natural resources. We elaborate the profound adverse impacts on women due to existing social inequalities and the need to mainstream gender into adaptation policies. In addition, we feature activities by youths globally that aim at tackling climate change. They share their aspirations and fears in the face of this crisis.

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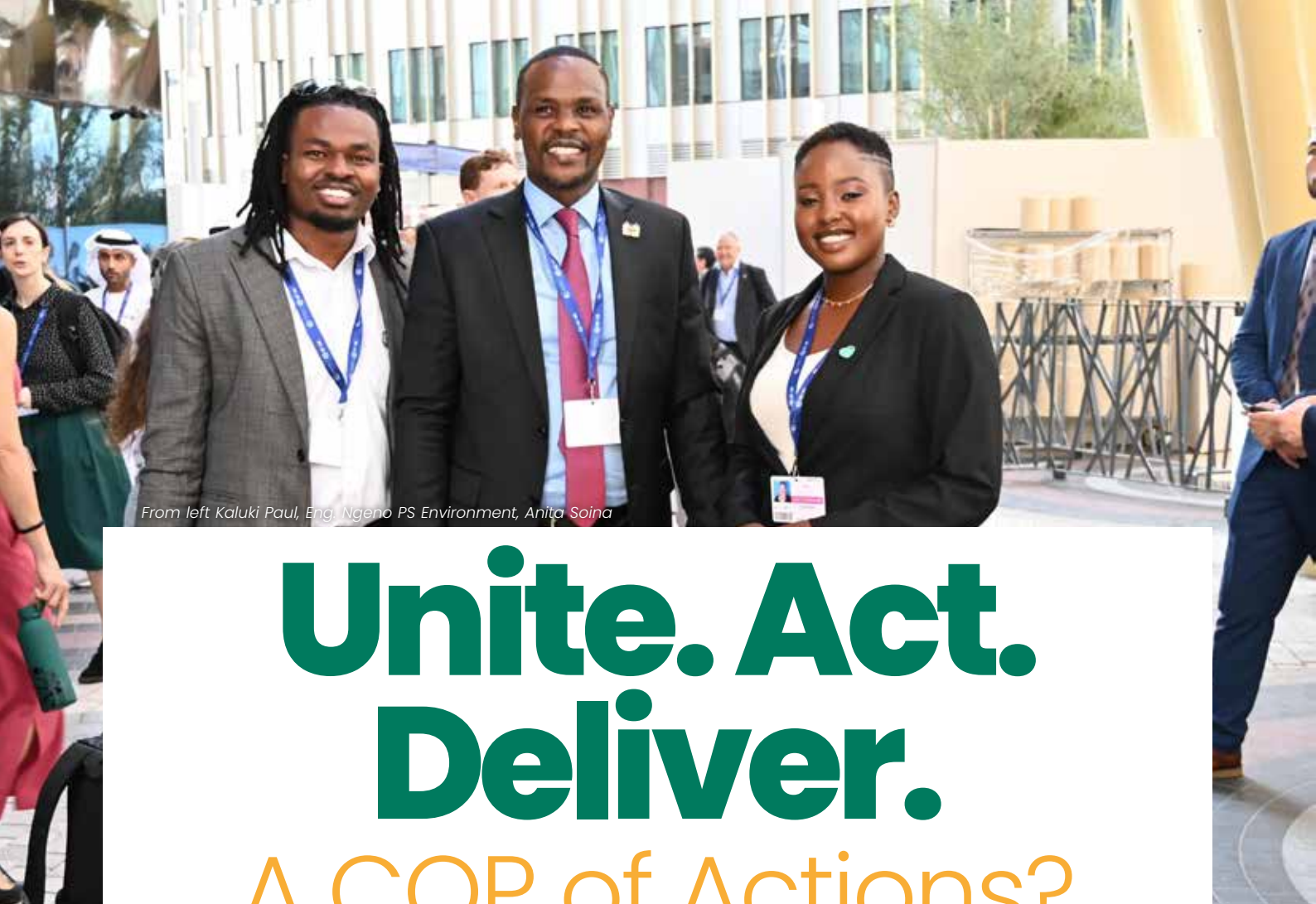
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Unite. Act. Deliver.

A COP of Actions?

WHAT TOOK ME TO COP – AFRIKA YOUTH CARAVAN TO COP28, KEY MESSAGES

The 28th session of the United Nations Framework Convention on Climate Change (UNFCCC) took place in Dubai, UAE from November 30th to December 12th, 2023. Themed; Unite, Act, Deliver – the focus was largely on how the world can together move into a just world, with ambitious action on climate leadership, delivering loss and damage fund for the world's majority, aka Global South, and serious actions on nature, food sovereignty, water, Health and soil funds.

The Conference also marked the world's first Global StockTake (GST), established under the Paris agreement as a periodic rate card that shows how countries are performing in regards to commitments to abate the climate crisis.

I attended the COP28 as the project lead for the Afrika Youth Caravan to COP28. As a build up of

last year's caravan where we took 21 youth across Afrika to Sharm-El-Sheik, this year we leveraged on the power of digital campaigns and films to carry impact messaging on the need to invest in youth solutions, deliver just energy transitions, operationalise loss and damage, and get actions on Nature-based Solutions, Resilience and Adaptation.

ROLE OF THE YOUTH:

The youth are forming a growing proportion of the world's population. Afrika alone is already the world's youngest continent, with a fast growing youth demography. So then, what role do youth leaders play in the climate space? Well, quite a lot actually. Youth have a strong energy, creativity and time to innovate and deliver on-the-ground solutions in the communities. Youth also have a key role in policy influence and decision making spaces around the climate agenda. Some notable influences around COP28 for the caravan as well as for other youth delegations were;

Side events and advocacy. The Caravan delegation hosted 6 key side events over the course of the 2 weeks of negotiations. Ranging from showcasing youth solutions, to investments in youth projects, Youth reception on Resourcing Youth Solutions, Impact Storytelling and Enhancing cross border collaborations. These sessions brought the face of Afrika's youth as solutions bearers, and leaders in the climate, biodiversity, technology and community arena. Youth leaders organized and programmed some more impact sessions across pavilions; Extreme Hangouts, Entertainment + Culture, Climate Live, Liberia, Boreal boardroom, Columbia pavilions, Children and Youth pavilions, among others. COPs are always seen as busy spaces, and that is true. But they also serve as important Networking avenues for amplifying youth leadership. Youth get to share the same stage and interact with heads of state, governments, investors, civil society and other constituencies. This is a rare opportunity to connect, forge partnerships and make tangible progress on solidarity building for climate action. And this is one thing COP28 did for us.

Negotiations. Youth also have a key role in influencing and participating in negotiations. This year, Kenya and many other Afrikan countries delivered increased party badges. While this did not necessarily mean full access into interventions for party submissions, it was a strong addition to access within negotiation rooms, and allowed youth to learn how the processes go, and build their confidence for the subsequent COPs.

Solutions and momentum building. Action does not

actually happen at COP. Action takes place in the communities. So youth attending COPs has to be from a point of bringing the solutions, interventions and impact they have in their communities. This should be a community building and network enhancement space that contributes to increased actions and delivering of impact at the local level.

OUTCOMES:

Throughout the year, a lot of focus has been put on operationalisation of the loss and damage fund, just energy transition, and global goal on Adaptation. The 2 weeks of COP saw heavy negotiations, delays and streamlining of what would be the "desired" outcome. Civil society groups, Indigenous Peoples and Local Communities (IPLCs), Small Island Developing States (SIDS), Least Developed Countries (LDCs), pushed for a total phase out decision in the eventual text. In the end, phase out language did not surface. Instead, a COP28 text on "beginning of the end" of the fossil fuel era. Some progress for sure, as this is the 1st time mention of fossil fuel in a COP text. Though not a big success, this text puts the base for increased tight action on Phase out - when, where, timelines and urgency is needed, in future COPs. Clear timelines and accountability on phase out needs to be lobbied and put up as a text sooner than later, as the climate crisis is worsening, and further delays will only validate denials that have caused the havoc we are in.

On the Global Goal on Adaptation, some progress on doubling financing for locally-led adaptation is made, but nowhere near to what is actually needed. Adaptation financing needs to come mostly in the form of grants, and local communities who are most impacted by the climate crisis must lead in the designing and delivering of the grants formalities.

On Loss and Damage fund - about 700 million USD committed on the 1st Global Stock Take GST at COP28. This is a first good step, but to reach the minimum 100billion dollars annually for loss and damage needs clear commitments and availing of the funds. This needs to be new and additional, not part of current climate financing.

Pledges on food systems transformation, health, water, arrived at COP28. More financing was announced for these key areas that need support to abate the climate crisis. A successful pointer was agreement by parties to triple global energy capacity and double the rate of energy efficiency by 2030.

WAY FORWARD:

To me, this was one of the most progressive COPs, having attended 4 COPs to date. The organization infrastructure, logistics, sessions programming, access, everything was delivered in a better way. The final text was not what many would have wanted to see, but it is a positive step into what future we all want. Amidst all these, below are some action items that can guide us into the upcoming COP29.

1. We must influence the outcomes of the COP28 text. While recognising the need to phase out fossil fuels, the mention of an end to the fossil fuels era is a good starting point on COPs. What is needed is clear timelines now, and actual commitments by the oil producers and countries dependent on fossil fuels exploitation. We need to close the tap on fossil fuels and usher in the new wave of renewable energy.
2. We must follow the money, and ensure it goes directly to those impacted. No gatekeeping, no injustice, no lack of transparency. So many commitments on financing needed for climate action were announced at COP, and this should be tracked to the last bit. Every dime is needed, and even more needs to be availed. So, let us not tire. We must follow the

money, hold accountable world leaders and people who made pledges.

3. Invest in Youth. Support youth, community and grassroots solutions. We can only successfully get out of the current crises if we recognise the power of youth, indigenous, women and local communities in delivering impact solutions. By investing and financing their solutions, we are half-way there, at solving the climate crisis. Youth is the future, and the future is now. Indigenous communities are the real guardians of our planet, having done so for so many centuries, they need to be supported, and their rights protected so as to ensure continuous guardianship of our planet.
4. Deliver Loss and Damage more, and keep filling in the gaps. The loss and damage fund should not be fronted as a favor to the world's most vulnerable, but as a right to them for suffering the most out of a chaotic system they did not create. Avail the loss and damage financing to them without strings attached.
5. Lead on strategic campaigns that push the decisions demands stronger towards COP29. From Energy justice to food sovereignty, human rights to health, nature and biodiversity, water and education, we need to support action campaigns to ensure the momentum is maintained, and enhanced. COP29 must build up on COP28, and serious actions on fossil fuels, finance, just transition achieved!



Kaluki Paul
Executive Director - KEAN
Project lead - Africa Youth Caravan to COP28





"I gained valuable insights and strategies which will enable me to contribute to the global effort in tackling climate change, specifically in strengthening protection mechanisms on biodiversity and enhancing inclusive participation in the law and policy making process across the continent."

REFLECTIONS FROM THE AFRICA CLIMATE WEEK

Most typical stories start with the ambiance – or a background voice to set the tone of the conversation. In this light, I would say that it was a cold morning, when I got squished in a line in order to attend the official opening of the Africa Climate Summit, a humbling moment indeed, similarly experienced when collecting my badge. However, the important question to ask is **why was I there?**

As part of the COP28 International Youth Climate Delegate Program, I was afforded the opportunity to attend the Africa Climate Week (ACW), Africa Climate Summit (ACS) and the African Youth Climate Assembly (AYCA). It was a challenging week of attending sessions, networking and getting to visualize my role in the climate space while supporting my community and country. My passion is formed from seeing the thunderous reality of climate change effects on African nations which are vulnerable. From floods, to landslides, raising temperatures and seas, all these realities are close to my heart, especially coming from a coastal community in the beautiful shores of the Kenyan Indian Ocean.

Before – on road to the ACS

It is important to point out the interesting events that took place before the summit. These events, though may be easily dismissed, should be highly considered in looking overall at the preparation of African countries' position on the upcoming United Nation Climate Change Conference – Conference of Parties 28, (COP28).

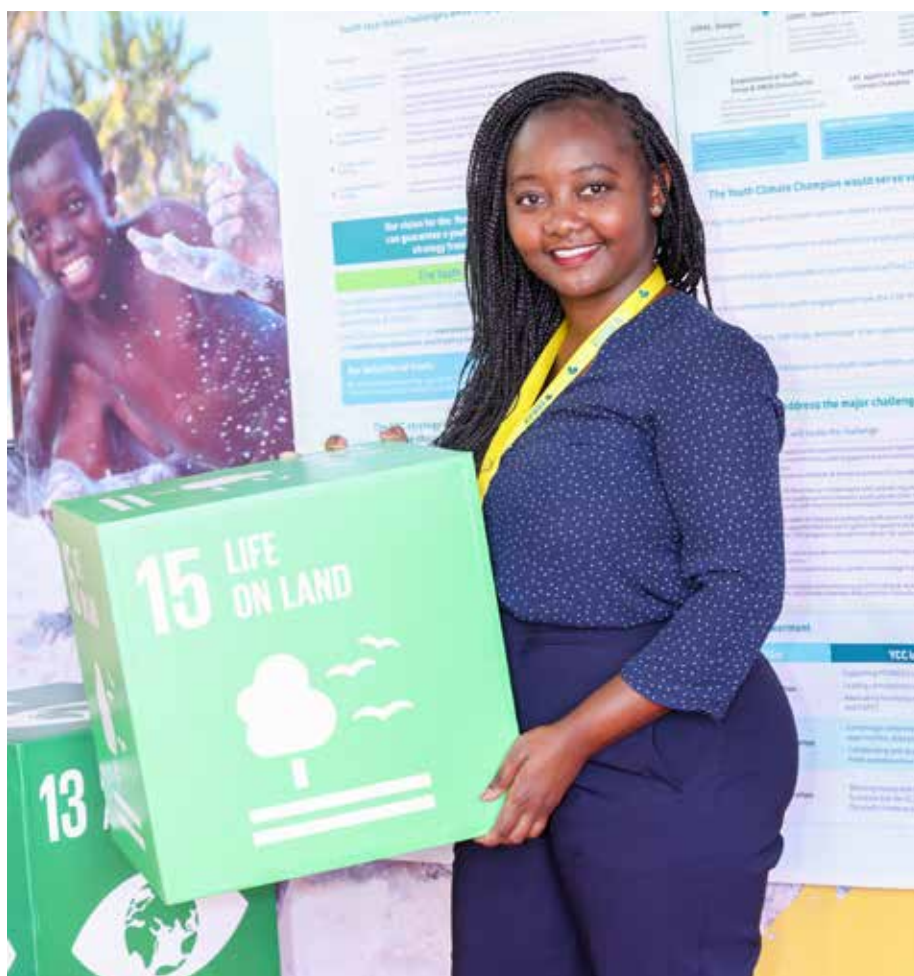
One, there was major concern on the summit being seized by western governments and philanthropic organizations in pushing for the western narrative with others terming solutions like carbon markets as ineffective solutions. Civil society organizations urged the summit to take a significant stance for the continent and , in Kenya, published a non-state actor demands and redlines which urged for standing by the principles of climate justice, human rights, gender equality, and intergenerational equity; committing to a just and equitable transition of renewable energy; fulfilling of historical responsibility as required of developed nations; advancing collective accountability in African leadership and African people to be put above all interests.

Two, the AYCA took place for three days before the ACS. It brought together youth from different African regions and culminated in a youth declaration which simply emphasized youth recognition, participation and inclusion in the climate change space. The declaration specifically noted that *“Africa has the youngest population in the world, with 70% of sub-Saharan Africa’s population under the age of 30, and that by 2030, young Africans are expected to constitute 42% of global youths, hence African continent can reap from this demographic dividend in the shaping of the green growth*

agenda.” However, gaps that were apparent were in the inclusion of youth from other African countries in the Assembly participation, and inadequate preparation for the assembly in terms of where sessions were taking place and access to required badges to access the venue.

During the ACS

The COP28 is right on the corner with countries preparing to participate in the party processes on the issue of climate change. Key topics in this COP include fast – tracking the energy transition, transforming climate finance, putting nature, people, lives and livelihoods at the heart of climate action, and mobilizing for an inclusive COP. The ACW is one of the regional climate weeks that took place in preparation for the COP 28. It was held from September 4th to 8th in Nairobi Kenya. The ACS happened parallel to the ACW but it ended on the 6th. The ACW had thematic focuses on Energy systems and industry,



Mary at the ACS

Cities, Urban and Rural settlements, Infrastructure and Transport, Land, Ocean, Food and Water, and Societies, Health, Livelihoods and Economies.

In developing a roadmap for a sustainable future, I believe that the ACS brought together African leaders, youth, communities, academia, scientists, and activists in an effort to embody the spirit of partnership,

role of communities, marginalized groups and the youth in implementing nature based solutions and policy involvement. Highly noted were nature-based solutions, such as afforestation, reforestation, and ecosystem restoration which contribute to both carbon sequestration and biodiversity conservation. Emphasis was made on having a transparent robust governance mechanism and equitable distribution of

benefits especially to communities. Culminating from the series of discussions during the ACW, the Nairobi declaration was agreed by the parties.

Notably, by the time the summit was concluding, several biodiversity and nature based solutions related sessions were taking place the next few days. I believe that these sessions had invaluable learning that would have fed into the ACS.



Mary navigating events on the ACS application

and dedication to tackle and provide solutions to climate change concerns. Because Africa is the most vulnerable to the effects of climate change and contributes the least, it must be the centre of focus in demonstrating its ingenuity, adaptation techniques, and willingness to confront the ever-increasing risks posed by climate change. Furthermore, the conference emphasized the essential role of youth in raising awareness and consistently working on climate change issues. The ACS was a clear call for swift action to ensure a greener future for current and future generations.

What happened?

The summit mostly focused its attention on carbon markets, with sessions ranging from expanding Africa's role in voluntary carbon markets, accelerating carbon markets supply, harnessing Africa's renewable energy potential and nature based solutions.

Participants from diverse backgrounds explored the interconnectedness of these two topics, potential of incentives derived from carbon markets and the

Participating in the AYCA, ACS and ACW, provided me with an invaluable opportunity to contribute in meaningful discussions and exchange knowledge on pressing climate challenges facing the continent. With the diversity of stakeholders and participation in sessions, this shone a spotlight on the potential for innovative approaches to mitigate climate change while promoting sustainable development. Additionally, the Nairobi Declaration, with its strong commitment to climate action and financing mechanisms, sets a promising path forward for Africa though further actions need to be done. By attending the events, I gained valuable insights and strategies which will enable me to contribute to the global effort in tackling climate change, specifically in strengthening protection mechanisms on biodiversity and enhancing inclusive participation in the law and policy making process across the continent. I hope that lessons learned shall be translated into concrete actions and partnerships in the pursuit of a sustainable.

Mary Morrison
Governance and Wildlife Attorney

A portrait of Charles Karangwa, a man with short dark hair and a goatee, wearing a dark suit, light blue shirt, and patterned tie. He is standing outdoors with green foliage in the background. The text is overlaid on the lower left of the image.

CHARLES KARANGWA

**GLOBAL HEAD OF NATURE-BASED
SOLUTION HUB, IUCN**

Congratulations on being appointed as the Global Head of nature-based solutions hub with IUCN. What does the hub aim to solve?

Thank you and happy to be here talking about NbS, something that is very close to my heart. Preceded by its adoption by the 98th Meeting of the IUCN Council in February 2020, the first-ever Global Standard for

Nature-based Solutions was launched in July 2020. This was after 20 years of research and consultation with experts and countries across the globe to ensure a common consensus on its definition, how best to develop the standards, and what it entails in terms of indicators and criteria. While they are known to address multiple sustainability crises, including climate change, food and water security, land degradation, and biodiversity loss, the NbS are either underutilized or misunderstood hence the reason why IUCN took the bold step to develop the standards.

To support governments and societies in the adoption and utilization of NbS as best practice, IUCN is setting up NbS hubs to serve as technical centers of excellence.

We want to create more awareness; especially on the importance of NbS and building capacities across Africa; on how to develop the solutions and implement them on the ground.

Land degradation in Eastern Africa is on the increase as a result of desertification, land fragmentation, mono-culture, and urbanization. How are the IUCN Decade of Ecosystem Restoration, Bonn Challenge, and AFR100 responding to reverse the land degradation challenges?

In the last 2 decades, IUCN has made significant efforts to address the said global challenges. For example, in 2011, IUCN together with the government of Germany launched a global restoration initiative commonly known as Bonn Challenge (BC) that has seen the commitment to restore approximately 129 million Ha of land in Africa where 47% of these commitments are within the Eastern Africa region.

Further in addressing these challenges, IUCN has been at the forefront of the continental efforts to domesticate the initiative in Africa including the launch of the AFR100. Soon after the announcement of the BC, IUCN in collaboration with WRI developed a Restoration Opportunity Assessment Methodology – ROAM – which is used by countries in determining their restoration potential and developing feasible and sustainable restoration land use options. Using ROAM, IUCN has supported several countries in Africa to understand their restoration potential and priorities. In EA alone IUCN has supported a number of countries

among them Kenya, Uganda, Tanzania, Rwanda, Burundi, and Ethiopia in undertaking restoration assessment and developing restoration strategies towards achieving their 2030 targets.

IUCN has also developed a global restoration monitoring framework known as the Restoration Barometer that helps countries monitor restoration progress against the commitment made. So far IUCN has supported 13 countries in the continent in the application of the barometer with the latest application in EA being in Kenya, Rwanda, Burundi, and Ethiopia. The application is currently underway in Tanzania. Through restoration stock take countries can track the restoration progress to inform the required actions and efforts including but not limited to financing, strategies, institutional coordination, and so on.

Apart from using data and science to inform actions and policy direction in the region, IUCN is also on the ground implementing restoration activities through various projects aimed at restoring degraded lands and ecosystems, halting biodiversity loss, increasing climate resilience, improving lives, livelihoods, and human well-being, and developing innovative and inclusive financing mechanisms. Talking about financing, IUCN has been at the forefront of supporting countries in developing multilateral donor-funded projects which have been transformative and catalytic enabling countries to accelerate their restoration efforts. For example, IUCN has supported the development and implementation of landmarking GCF/GEF projects in Kenya, Uganda, Tanzania, and Rwanda. IUCN has recently concluded an integrated water resource management project (Sebeya) that has seen a successful application of the community-centric restoration model in Rwanda and is expected to inform the development or implementation of several other projects including:

- AREECA, COMBIO and TREPA in Rwanda
- The scaling up of the Sebeya in the Rusizi basin (Rwanda, Burundi and DRC)



COP 26 in Glasgow was dubbed “Nature COP”. 137 countries committed to collectively end forest loss and land degradation by 2030 and a total of \$19.2 billion was pledged to help protect and restore forests globally. Have these ambitions been followed through with commitments by the countries and non-state actors that signed Glasgow Leaders’ Declaration On Forests and Land Use

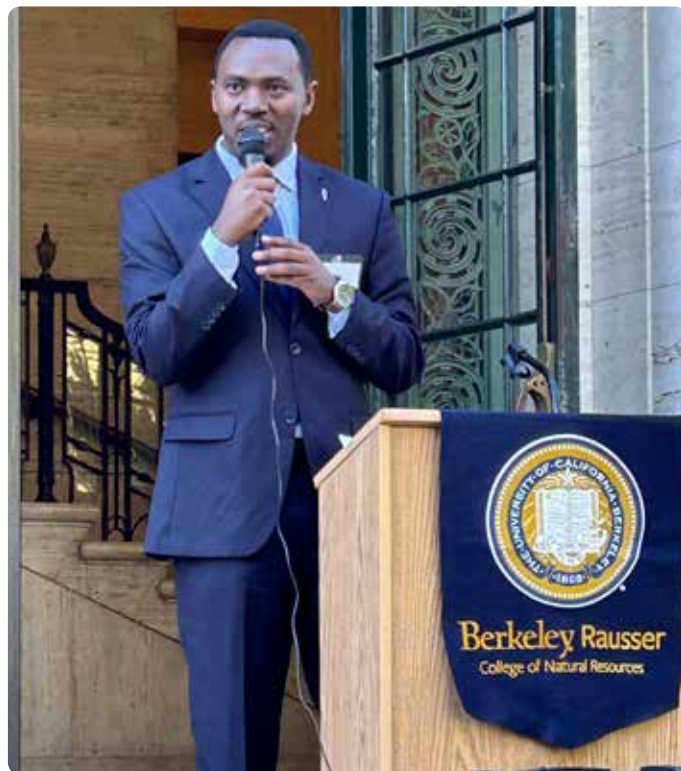
In terms of making the funds a reality, very little has been realized and I think these were the same sentiments expressed by African Leaders during the recently held ACS in Nairobi.

Rwanda has one of the highest forest cover in Eastern Africa with at least 30.4% of the country covered with Forest. What has been the key to this success and what role is IUCN playing in ensuring drought-degraded landscapes in Northern and Eastern provinces of Rwanda are restored?

IUCN is very proud to have been a key partner toward the realization of Rwanda’s 30.4% forest cover.

Rwanda’s ambitious commitment to environmental protection is a major success factor. Starting from setting ambitious national targets {such as tree cover through Vision 2020 and Bonn Challenge by 2030} speaks for itself. Other success factors include; a responsive policy and governance framework, a cross-sectoral coordination that encourages synergies, and continuous innovation for example with recent development and adoption of a community-centric restoration model, Village Land Use Plans, and Catchment Restoration Approach. Rwanda is also keen on the use of data and science in developing local solutions. For example in all restoration projects Rwanda has been using ROAM in baselining its restoration projects and setting up restoration targets. Rwanda is known to have been the 1st country in Africa (2014) to deploy ROAM in restoration planning and thereafter radiating the application into several countries in Africa.

In terms of restoration monitoring, Rwanda was the first country to apply the Restoration Barometer and has since then revamped its local monitoring framework DFMP-FMES well aligned with the Restoration Barometer Global framework.



In 2019, the government of Rwanda together with IUCN undertook a national forest cover mapping exercise which reported a 30.4% forest cover from a previous cover of about 16% a decade before. Additionally, IUCN has supported ground-breaking efforts in developing the country’s soil erosion control analytics which allows the government to address soil erosion challenges at a plot level.

In our continued efforts to support the government of Rwanda, IUCN is implementing a number of projects including the just Sebeya (22m EUR), ARECA (4.3m EUR), COMBIO (8.9m EUR), TREPA (33m USD), and others.

What should businesses do to halt forest loss associated with agricultural commodity production of crops like Sugarcane, Tea, and Palm oil in Africa that have been dubbed import substitution ventures by Governments?

We cannot ignore the factor of low production/supply of raw materials in these issues. This is largely due to a decline in soil fertility. Going forward the companies need to invest more in soil fertility to ensure sustainable production and hence business sustainability. By NBS and investing along supply chains, the companies can improve/maximize production and will consequently encourage reduced exploitation of more lands hence reducing deforestation and emission. IUCN

has been engaging private businesses in the region in developing nature-positive business models that are profitable and sustainable. For example, between 2019 and 2021 IUCN engaged Kilombero Sugarcane Company in Tanzania to develop a business case where the sugarcane company would invest in nature through NbS to improve water yield and soil health thus maximizing production and avoiding further deforestation through expansion of out-growers.

How is IUCN Kenya Portfolio in line with Government of Kenya goal of growing 15 billion trees by 2030, mobilizing climate change financing and empowering communities through nature based solutions?

Through the development and implementation of various projects and providing the necessary technical assistance IUCN is keen on supporting Kenya's ambitious efforts on 15 billion trees. Currently, IUCN is working with the government on a number of projects including; the 30m USD GCF project in 11 counties and 6m GEF project in 2 counties. Others include; a 3m coastal resilience project known as Save Our Mangrove Now (SOMN) and an IWRM project known as Sustainable Transformational and Accessible Water Interventions (STAWI) funded by DANIDA. IUCN continues to provide the necessary technical support on restoration assessment and monitoring both at national and subnational levels.

The African Climate Change Summit that will be held in Nairobi in September 2023 comes at a time when the African continent has been hit hard by weather related disasters like prolonged drought in the horn of Africa and Cyclones in Southern Africa. What issues should the African countries discuss and resolve as a team before they head to COP 28 in DUBAI?

Carbon taxation, Loss and Damage facility, annual climate finance, and several other announcements in the previous COPS are great steps toward climate justice. However African leaders need to understand that there are no legally binding commitments and therefore a need to do more in terms of financing and actions around mitigation and adaptation. We have had so many commitments in the past and many of them to this end have not been kept. I believe there is a reason and needs to be discussed

further. But before that, in my respectful opinion, Africa needs to develop a well-structured and investment-attractive financing mechanism that doesn't just pay for damage but brings justice to all.

The youth and women in Africa have been severely affected by climate change. What opportunities can they tap in to ensure they become resilient and does IUCN have facilities that can support nature-based enterprises managed by women and youth in Africa?

Indeed gender equality is key when we all about climate change, biodiversity, desertification and degradation, and other sustainable development spheres.

Unfortunately, our youths and women have for far too long been victims of climate disasters primarily because of the imbalance around land rights and land use men are historically and in large proportion man as seen as the authority and then one and youth have to take a back seat and watch.

Cognizant of this imbalance, IUCN has been keen on mainstreaming gender-transformative and responsive mechanisms in all its programmes. For example within the land systems programme, IUCN has developed gender-responsive FLR guidelines outlining Gender Golden Procedures to ensure the voice and role of women and youths throughout the restoration process – from the restoration assessment to actual implementation.

IUCN has also developed innovative financing mechanisms models, such as CECF that continue to enable access finance to for women and vulnerable groups and encourage bio-enterprising at the community level. The model has so far rolled out in Kenya, Uganda, and Rwanda.

PARTING SHOT

Climate disasters are not waiting for us. Unfortunately, we have taken much time talking and planning yet we all know the dangers of climate change and time is ticking fast! As the UN Sec General said sometime back, we need more actions than talk. This is the only way we can move forward.

Charles Karangwa, Global Head of Nature Based Solutions (NbS) Management Hub, International Union for Conservation of Nature (IUCN)

Tana River County

Tana River County is one of the 47 counties in Kenya. The County has embarked on the enactment of key policies and legal framework on climate change. Mainstreaming of climate change into the County plans including the County Integrated Development Plan (CIDP), Annual Development Plan (ADP), Sectoral Plans etc. was also done to build community resilience against the impact of climate change at the same time implementing the mitigation measures.

STATUS OF IMPLEMENTATION

1. Tana River County Climate Change Act 2021

The County has enacted **The Tana River County Climate Change Act 2021** into law after the bill has been approved by the County Assembly of Tana River and subsequently accented into Act on 6th August 2021 by His Excellency The Governor Dr. Major (Rtd) Dhadho Gadae Godhana. The Act was published by The Kenya Gazette on 1st November 2021. The purpose of this Act is to enhance climate resilience through development, management, implementation, regulation and

monitoring of adaptation and mitigation measures and actions. This Act had come into effect in November 2021 and its operationalization is ongoing. This act is in line with **The Climate Change Act 2016** and intends to build on the efforts done by National Government on adaptation and mitigation measures on climate change. On the status of implementation of the act, the County has started establishing key structures. The act has three (3) committees including;

2. County Climate Change Steering Committee

Section 5 of the Tana River County Climate Change Act 2021 established County Climate Change Steering Committee.

Section 7(1) states that the Steering Committee shall comprise of 11 members who shall be appointed to the committee by the Governor.

In a letter dated 17th May 2023 the Governor His Excellency Dr. Major (Rtd) Dhadho Gadae Godhana nominated the members of the steering committee by forwarding the names to County Assembly of Tana River. Subsequently, the steering committee was approved by the House on 9th August 2023. The committee was launched by H.E. The Governor in a ceremony held at County Headquarters on 12th August 2023.

3. County Climate Change Planning Committee

Section 15 of the Act established the County climate Change Planning Committee, which shall comprise of 10 members appointed to the Committee by the County Executive Committee Member for the time being in-charge of climate change matters.

In a letter dated 18th May 2023 CECM Environment and Climate Change nominated members of planning committee by forwarding the names to the County Assembly of Tana River. Subsequently, the planning committee was approved by the House on 1st August 2023. The committee was launched by H.E. The Governor in a ceremony held at County Headquarters on 12th August 2023.

4. Ward Climate Change Planning Committees

Section 23 of the Act state that Ward Climate Change Planning Committees shall be established in all the 15 wards of the County. The process of the nominations of ward committees is spearheaded by Ward Administrator in the presence of Sub-County Administrator or his representative at ward offices {Section 25(2)(3)(4)(5)}. After nomination process, the Ward Administrator shall submit the names of ward committee members to County Chief Officer for formal appointment. The committee comprises of 8 members including seven community members of different interest groups (youth, elders, persons living with disability and community-based organization).

These committees have been established in all the wards and formal appointment was done by the County Chief Officer for Environment and Climate Change effective 1st November 2022.

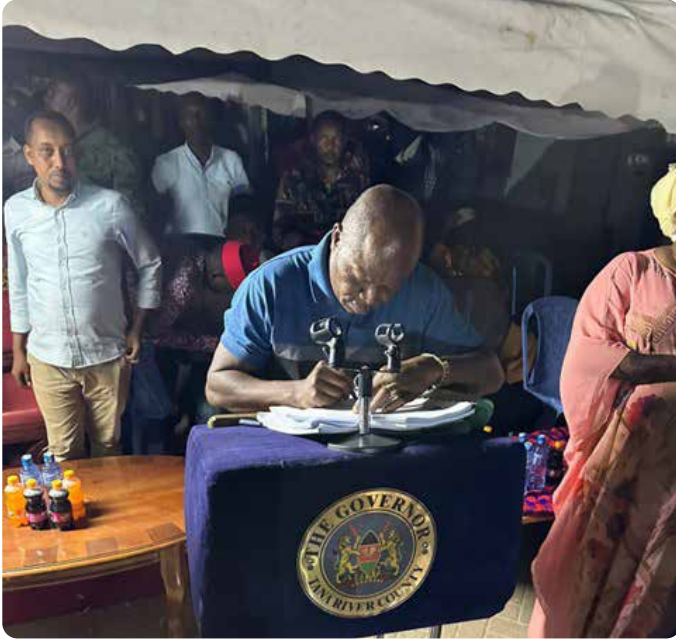
5. Fund Administrator

Section 46(2) states that the Fund Administrator is appointed by the CECM for Finance in consultation with the CECM for Climate Change. The Fund Administrator will sit in both County Steering and County Climate Change Planning Committees as an *ex-officio* member (with no voting rights) to provide updates on the financial status of the County Climate Change Fund.

The Fund Administrator was appointed on 14th February 2023 by CECM Finance and Economic Planning.

ESTABLISHMENT OF COUNTY CLIMATE CHANGE FUND (CCCF)

Section 46(1) of the Act calls for the establishment of the County Climate Change Fund (CCCF) *to provide funding for priority climate change actions and interventions identified by communities and other stakeholders and approved by the Steering Committee.* The county has committed in this Act (Section 47(a)) **to allocate not less than 2% of the county development budget to this fund.** The County has actualized this promise by allocating



His Excellency Major (Retired) Dr. Dhadho Gadae Godana the Governor Tana River County Signing Copies of CCCAP during the launch on 12th August 2023 at County Headquarters.

KES 50,000,000.00 in this Financial Year (2022/2023) to the development vote head of the CCCF. **For the Financial Year 2023/2024 the County has allocated another 50,000,000 for this fund. The County has opened Special Purpose Account (SPA) with the Central Bank of Kenya (CBK) as per Public Finance Management Act 2015 in the management and administration of public funds.**

6. The Tana River County Climate Change Fund Regulations 2023

Section 48(1) of the Tana River County Climate Change Act 2021 states that the County Executive Committee member in-charge of Finance shall, in consultation with the County Executive Committee Member Environment and Climate Change, develop Regulations for administration and management of the Fund.

The Fund Regulations was approved by the County Assembly on 30th May 2023.

7. Participatory Climate Risk Assessment (PCRA) Report February 2023

The County did the Participatory Climate Risk Assessment (PCRA) assessing the exposure to climate hazards & risks and social vulnerability to climate

change. This process started with the stakeholders meeting on 12th January 2023 in Hola where we formed the cross-sectoral technical working group. The technical working group was later trained for one week before data collection was done in each of the 15 wards of the county from 30th January 2023 to 4th February 2023. The Ward PCRA reports was developed for each ward which was later collapsed into one county PCRA reports. The County PCRA report was subjected to a validation process at a multistakeholder workshop in Hola.

As per the report, the main climatic hazards which the residents of Tana River are vulnerable to are:

- Drought affecting all the wards in the County
- Floods affecting wards such as Chewele, Madogo, Chewani, Mikinduni, Garsen North, Garsen West, Garsen Central, Garsen South, Kipini East etc.
- Invasive species affecting all the wards in the County
- Conflicts (human-wildlife conflicts, nature-based conflicts etc.)
- Pest and Diseases
- Sea Water Intrusion in Kipini West and Kipini East Wards

The County formulated the County Climate Change Action Plan 2023–2027 to tackle these hazards.

8. County Climate Change Action Plan 2023–2027

Section 32(1) of the Act state that there shall be



Hon. Mathew Babwoya, CECM Environment and Climate Change addressing the members of the public during the launch of County Climate Change Steering Committee.

a **County Climate Change Action Plan (CCCAP) 2023–2027** to run concurrently with the **National Climate Change Action Plan 2023–2027** and third generation **County Integrated Development Plan (CIDP) 2023–2027**. During our engagement with the FLLoCA program we were made aware that the county **MUST** do Participatory Climate Risk Assessment (PCRA) before CCCAP. In this regard, the County has first done the PCRA assessment in all wards in February 2023 and formulated CCCAP 2023–2027 in May 2023. The plan was validated by community and stakeholders on 23rd May 2023 in all the sub-counties and was approved by County Executive Committee (County Cabinet) on 26th May 2023. The Plan was later forwarded by CECM Environment and Climate Change to County Assembly in a letter dated 29th May 2023 for adoption. The Plan was approved by the House on 9th August 2023 and later launched by His Excellency the Governor on 12th August 2023.



Director Climate Change addressing the residents of Chewani Ward during election of Chewani Ward Climate Change Planning Committee members at Chewani village in a meeting held on 7th October 2022.

The Action Plan has six chapters as follows:

Chapter 1: Introduction

Chapter 2: Action Plan formulation process

Chapter 3: Review of Relevant Policies and Legal Frameworks

Chapter 4: Vulnerability to climate related hazards in Tana River County

Chapter 5: Climate Change Adaptation and Mitigation Plan

Chapter 6: Plan Monitoring and Review

The main chapter is the chapter 5 which focuses on adaptation and mitigation plans. Under this chapter we have 8 strategic areas which is prioritized in the next five years. These are:

1. Food and Nutrition Security
2. Water Security and Blue Economy
3. Ecosystem conservation and sustainable

land management

4. Climate proof infrastructure, green energy production and use
5. Sanitation, Health and human settlements
6. Knowledge Management and Capacity building of community, stakeholders and county officials
7. Sustainable financing for climate actions
8. Governance and coordination of climate change adaptation and mitigation plan

As per the County Climate Change Action Plan 2023–2027, the County needs to mobilize KES 3.85 billion in the next 5 years to actualize these 8 strategic objectives. Out of this, the County can raise KES 250 million in five years from its allocation to CCCF and KES 445.5 million from FLLoCA grants in three years. This will leave the county with a gap of about KES 3.1 billion in five years. We call upon our partners and other well-wishers to bridge this gap for us.

9. The Tana River County Climate Change Finance Policy 2023

This policy was adopted by County Assembly on 14th March 2023. Some of the strategic interventions has been implemented while implementing the Tana River County Climate Change Act 2021. This includes;

1. Establishment of County Climate Change Fund (CCCF)

2. Establish the Tana River County Climate Change Fund Regulations for administration and management of the Fund as per the section 48(1) of the Tana River County Climate Change Act 2021
3. Carried out the County Level Participatory Climate Risk Assessment (PCRA) assessing the exposure to climate hazards & risks and social vulnerability to climate change.
4. Formulation of the County Climate Change Action Plan (CCCAP) as per the section 32 of the Tana River County Climate Change Act 2021
5. Establishment of the County Directorate of Climate Change. The Directorate was established through an Executive Order Number 1 of the Governor dated 11th October 2022.

The County will continue implementation of this policy and the Act to realize enhanced climate resilience through development, management, implementation, regulation and monitoring of adaptation and mitigation measures and actions.

10. The Tana River County Disaster Risk Management Act 2020

This Act was passed and implemented before the climate change act. Section 4 of the act establishes Disaster Risk Management Committees while section 9 county disaster risk management plan which will run for 5 years is entrenched. To implement this plan the act also under section 18 established Disaster Risk Management Fund.

11. The Draft Tana River County Climate Change Policy 2023

This policy was ought to have been the first policy formulated for climate change. However, this was not done as the Act, Fund Regulations, Climate Finance Policy and Action Plan all presided it. The County has now started the process of formulating this policy. The department of Environment and Climate Change developed the first draft which was reviewed by the

technical team drawn from the different departments, agencies and non-state actors. Next step is now the public participation forums at sub county level (with representation from each ward), then cabinet approval and county assembly adoption.

OTHER POLICIES AND PLANS

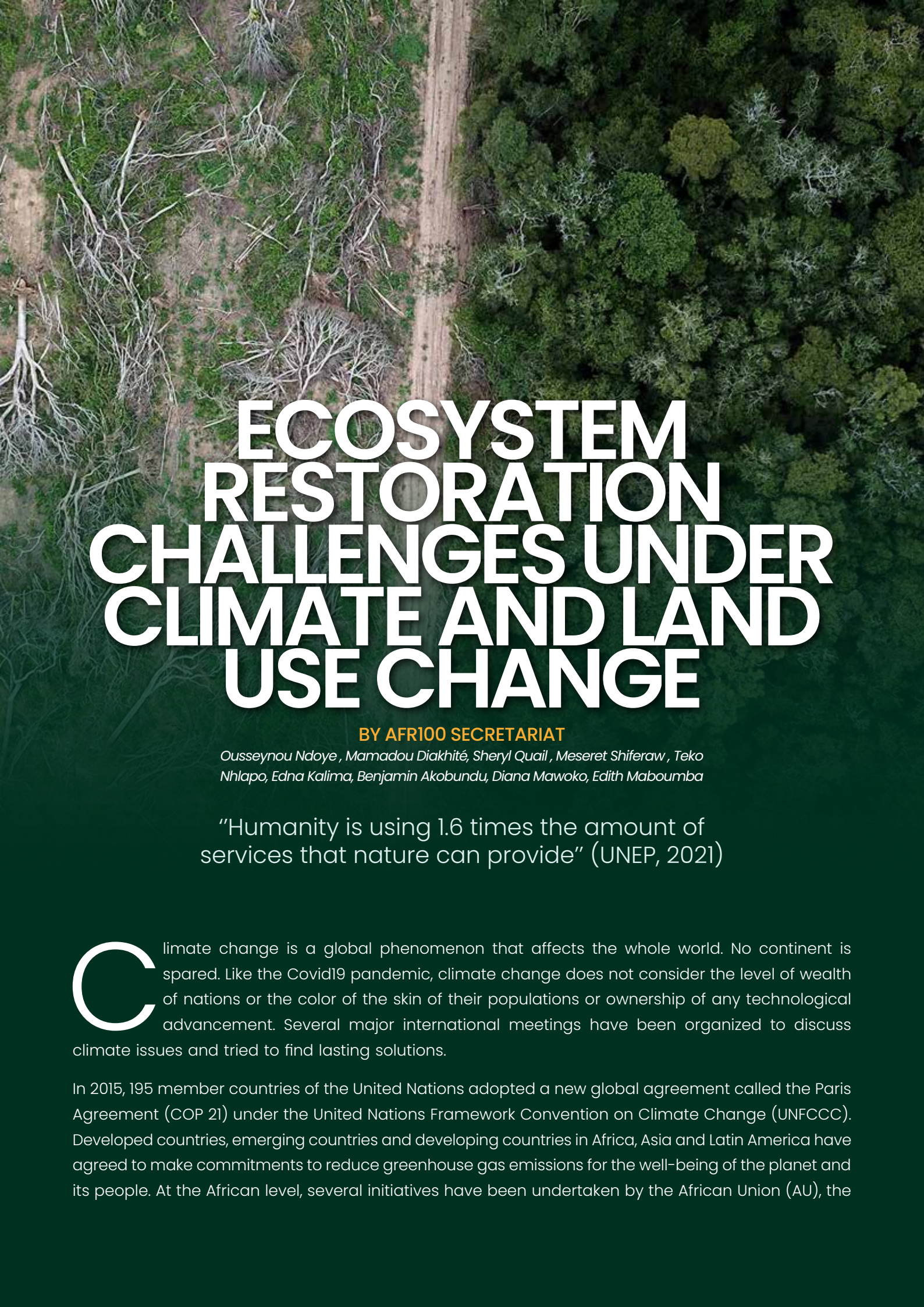
1. The Tana River County Forest Policy 2023
2. The Solid Waste Management Act 2022
3. The Tana River County Forest and Landscape Restoration Action Plan 2021-2030 (FOLAREP)
4. The Draft Environment Policy

ACKNOWLEDGEMENT

During the policy/acts/plans formulation and development the county was supported by different partners. We wish to acknowledge and thank them. For instance:

1. Nature Kenya supported the county during the development of Tana River County Climate Change Act 2021, The PCRA Report, The DRM Act, The County Climate Change Action Plan 2023-2027 (CCCAP), The County Forest Policy, The FOLAREP etc.
2. World Food Program (WFP) supported us in PCRA and CCCAP
3. GIZ supported us to develop the Tana River County Climate Finance Policy and now the County Climate Change Policy
4. CISP supported us in PCRA report and CCCAP
5. Welthungerhilfe (WHH) supported us in the Environment Policy
6. The Wetlands International supported us in the County Climate Change Action Plan 2023-2027

Kuso Hussein
Director Climate Change, Tana River County



ECOSYSTEM RESTORATION CHALLENGES UNDER CLIMATE AND LAND USE CHANGE

BY AFR100 SECRETARIAT

Ousseynou Ndoye , Mamadou Diakhité, Sheryl Quail , Meseret Shiferaw , Teko Nhlapo, Edna Kalima, Benjamin Akobundu, Diana Mawoko, Edith Maboumba

“Humanity is using 1.6 times the amount of services that nature can provide” (UNEP, 2021)

Climate change is a global phenomenon that affects the whole world. No continent is spared. Like the Covid19 pandemic, climate change does not consider the level of wealth of nations or the color of the skin of their populations or ownership of any technological advancement. Several major international meetings have been organized to discuss climate issues and tried to find lasting solutions.

In 2015, 195 member countries of the United Nations adopted a new global agreement called the Paris Agreement (COP 21) under the United Nations Framework Convention on Climate Change (UNFCCC). Developed countries, emerging countries and developing countries in Africa, Asia and Latin America have agreed to make commitments to reduce greenhouse gas emissions for the well-being of the planet and its people. At the African level, several initiatives have been undertaken by the African Union (AU), the

African Development Bank (AfDB) and sub-regional organizations such as the Economic Community of West African States (ECOWAS), the Economic Community of Central African States (ECCAS), the Southern African Development Community (SADC) to mobilize the resources needed to increase the resilience capacities of African countries in order to promote sustainable development and guarantee the social, economic and political stability of the various countries.

In 2007, the African Union launched the Great Green Wall Initiative (GGWI) aimed at fighting against climate change and transforming millions of lives in the Sahel. Its ambition is to sequester 250 million tons of carbon and create 10 million green jobs by 2030. Moreover, the African Union Development Agency-New Partnership for African Development (AUDA-NEPAD) is implementing the African Forest Landscape Restoration Initiative (AFRI00) launched in December 2015 at COP21 in Paris. The main argument of this manuscript is that forest landscape restoration (FLR) and the AFRI00 initiative contribute to combating climate and land use change in Africa because they address several challenges such as deforestation and land degradation; biodiversity loss; climate crisis; poverty; food insecurity; high level of unemployment for local communities including women and youth. A scientific article published in the journal *Conservation Biology* shows that FLR contributes to climate and biodiversity goals. In addition, restoring degraded forests and lands represent a strategic and cost-effective option for meeting national and global climate and biodiversity goals.

This manuscript aims to:

- a. Discuss the paradox of climate change for African countries;
- b. Provide a brief description of the African Forest Landscape Restoration Initiative (AFRI00) and its links with ongoing regional and international initiatives.
- c. Discuss few mitigation and adaptation actions drawing on the AFRI00 approach which aims, to reduce, among others, the

rate of deforestation and the negative impacts of climate change while improving food security and reducing poverty. The ultimate goal being to improve policies on climate and land use change in AFRI00 member countries.

- d. Discuss the impacts of Forest Landscape Restoration (FLR) at local, national, regional and international levels.

THE PARADOX OF CLIMATE CHANGE AND ITS IMPACT ON AFRICAN COUNTRIES

The paradox of climate change is that the least industrialized countries such as African countries, which emit less greenhouse gases, are the most exposed and therefore the most vulnerable. According to the African Development Bank, every year Africa loses between 5% and 15% of its Gross Domestic Products (GDP) because of climate change. The effects of climate change are, among others, the irregularity of the seasons, excess heat, the rise in the level of the oceans leading to floods and coastal erosion, the increase in drought, the decline in agricultural productivity, the deterioration of the health of populations, the increase in greenhouse gases caused by deforestation and degradation due to human activities, the loss of biodiversity, the increase in food and nutritional insecurity for populations, disruption of the transport system and market supply (especially in flooded areas), and reduction of tourist activities.

It therefore appears that climate change affects several sectors such as agriculture, forests and the environment, urban planning and housing, water and sanitation, energy, health, transport, tourism, industry, economy and trade. This is why the active engagement and use of a multi-stakeholder and multi-sectoral approach is very appropriate for the fight against the effects of climate and land use change. Therefore, restoration under the AFRI00 initiative is very appropriate in combating climate and land use change while improving the livelihoods of rural communities.

THE AFRICAN FOREST LANDSCAPE RESTORATION INITIATIVE (AFR100)

The AFR100 Initiative was launched in December 2015 to address the environmental, social and economic challenges that affect the sustainable management of natural resources in Africa. It is a Pan-African initiative implemented at the national level by 34 African countries and growing in collaboration with 39 technical partners and 13 financial partners. Its main objective is to restore 100 million hectares of degraded lands and forests by 2030. Currently the 34 countries have committed to restore 129.5 million hectares, which means that the initial commitment has been exceeded by 29.5 million hectares. Forest Landscape Restoration (FLR) is a process that restores ecosystem services and landscape functionality, boosts and stabilizes land use productivity, and enhances resilience to climate change through the restoration of degraded forests and lands (WRI, NEPAD, BMZ, World Bank, undated).

Restoration under the AFR100 initiative is very appropriate in combating climate and land use change while improving the livelihoods of rural communities.

At the regional level, the AFR100 initiative contributes to the African Initiative of Resilient Landscapes (ARLI); the African Union Agenda 2063; the Action Plan for African Landscape (ALAP); the African Great Green Wall Initiative (GGWI). At the international level, the AFR100 initiative contributes to the Bonn Challenge; the Paris Agreement on Climate; the New York Declaration on Forests; the United Nations Decade on Ecosystem Restoration; the United Nations Convention to Combat Desertification (UNCCD) Land Degradation Neutrality (LDN); and the Sustainable Development Goals (SDGs), especially SDGs 1, 2, 3, 6, 8, 11, 12, 13, 15, 17.

The second phase of the AFR100 initiative (2022–2026) put a major emphasis on the acceleration of forest landscape restoration on the ground to help countries meet their pledges by 2030. That is why smallholder farmers, communities, minorities, marginalized groups, women and youth entrepreneurs and associations have a major role to play during this phase.

MITIGATION ACTIONS TO COMBAT CLIMATE AND LAND USE CHANGE THROUGH RESTORATION

The mitigation activities to combat climate and land use change aims to reduce greenhouse gas emissions. Indeed, since the industrial revolution, the greenhouse effect has been amplified by the release of large quantities of gas (carbon dioxide or CO₂) into the atmosphere due to the massive use of fossil fuels such as oil, coal, natural gas; deforestation; landfilling; and certain environmentally destructive agricultural and industrial practices. To mitigate the effects of climate change, policies aimed at carbon sequestration and the long-term storage of carbon dioxide outside the atmosphere should be promoted. Reducing greenhouse gas emissions is one of the measures envisaged to achieve the commitments of the Paris Agreement on the climate. The following actions are needed to strengthen the climate change mitigation programs in AFR100 countries in order to sequester more carbon:

a) Introducing trees with high absorption capacity of carbon dioxide

African countries members of the AFR100 initiative should explore the introduction of the imperial tree, the Paulownia (*Pawlownia tomentosa*) which can absorb 10 times more CO₂ (carbon dioxide) than many trees. In addition, it cleans the air much faster. It is a fast growing tree native to China that is planted all over Asia and Australia. It should be noted, however, that all trees capture carbon dioxide, which is why the concept of growing trees must replace that of planting trees. The cultivation of trees includes the act of planting as well as the monitoring and management of all the steps downstream until maturation for the total success of the operation. Existing trees should also be maintained. Few trees with high carbon sequestration potential found in AFR100 countries are Rosewood (*Dalbergia latifolia* or *Acacia excelsa*), Moabi (*Baillonella toxisperma*), Bush mango (*Irvingia gabonensis* and *Irvingia wombolu*), Bubinga (*Guibourtia tessmannii*), Fraké (*Terminalia*

superba), Iroko (*Milicia excelsa*), Azobe (*Lophira alata*), Njanssang (*Ricinodendron heudelotii*), Gum arabic (*Acacia senegal*), Desert date or Soumpe (*Balanites aegyptiaca*), Baobab (*Adansonia digitata*), Shea butter (*Vitellaria paradoxa*), and Moringa (*Moringa oleifera*). With the availability of all these trees in AFR100 countries, one wonders why Africa still has several climate challenges? In particular, AFR100 countries in the Sahel should get involved in massive planting of baobab, shea butter and moringa trees to accelerate the fight against climate change.

AFR100 technical partners like CIFOR-ICRAF are playing an important role in this direction by boosting the availability and access to high quality planting materials thereby contributing to the restoration of degraded forest and lands and improving food security and nutrition. For example, the CIFOR-ICRAF **What to Plant Where** in Ethiopia portal allows stakeholders to find suitable tree species and their best matching seed sources at any planting locations in Ethiopia. Developing similar portals in other AFR100 countries will be very beneficial for the AFR100 initiative.

“Restoring degraded lands locks the carbon in the atmosphere in the soil. It also improves soil health, and increases the diversity of plants, animals and other species – (G20 Global Land Initiative).”

b) The increase in the number of protected forests

The decisions of public authorities in AFR100 countries to increase the number of protected forests fit well into the strategy of mitigating and anticipating the effects of climate change. In Senegal, protected areas represent 26.39 percent of the total land area in 2022. In Cameroon, protected areas represent 10.98 percent of total land area in 2022. In Gabon, protected areas represent 22.44 percent of total land area in 2022. The increase in the number of protected forests at national level is achieved by discussing with all the actors concerned to get full appropriation and ownership by the populations. The Paulownia tree and other tree species (mentioned above) that have a very high carbon dioxide absorption capacity should be promoted in protected forests to create several carbon sinks in Africa.

c) Reforestation, tree cultivation in urban and semi-urban areas and the creation of green cities

Mayors and local authorities should be mobilized to support tree planting along the various roads and in public spaces in their constituencies as part of the promotion of urban and peri-urban forests and the creation of green cities. The relevant sectoral ministries should also be sensitized for tree planting along highways and certain roads that are not in the administrative domain of mayors and local authorities. Elementary schools, high schools, vocational schools and universities must be included. Campaigns should be organized using the media to raise awareness among rural and urban populations, including youth, on the importance of trees in the fight against climate change and the conservation of biodiversity. In Senegal, youth represent 76 percent of the population which is an important demographic dividend to combat the negative effects of climate and land use change.

d) Restoration to increase soil fertility

Soil fertility has a positive effect on carbon sequestration. Promoting agroforestry activities by integrating nitrogen-fixing legumes into existing farming systems is a good approach to promote in AFR100 countries. Legumes such as Gum arabic (*Acacia senegal*), Caliandra (*Caliandra colothyrsus*), Leucaena (*Leucaena leucocephala*), Cadd (*Acacia albida*), and Neem (*Azadirachta indica*) will increase soil fertility and carbon sequestration to combat climate change.

A GIZ project in the Far North Region of Cameroon has restored the fertility of degraded lands that were no longer productive, and which were abandoned by local communities or landscape actors. In collaboration with the Ministry of Forest and Wildlife (MINFOF) and the Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED) of Cameroon, GIZ helped local communities restore those unproductive lands in 2 years by using traditional techniques and producing compost with organic manure mixed with *Crotalaria retusa*,

Bracharia spp. and *Mucuna pruriens*. In addition, tree planting has been initiated through the project to enable local communities protect watersheds, get fuelwood for cooking and non-timber forest products such as Gum arabic (*Acacia spp.*), neem (*Azadirachta indica*) and cashew (*Anacardium occidentale*) to enhance soil fertility and increase their revenues. With the project, local communities valorize biomass for livestock feed instead of burning it as it was done in the past.

e) Sustainable Cocoa Farming

In Ghana, smallholder cocoa farmers are improving yields and mitigating climate change at the same time by developing sustainable cocoa value chains that reduce emission from deforestation and forest degradation across 6 million hectares using shade cocoa trees and by improving farming practices and land use decisions. With support from the World Bank's Forest Carbon Partnership Facility (FCPF), Ghana is generating high quality, high integrity jurisdictional carbon credits to achieve its climate goals and get access to international carbon markets.

ADAPTATION ACTIONS TO COMBAT CLIMATE AND LAND USE CHANGE THROUGH RESTORATION

Adaptation is any action to support and enhance the ability to resist to the negative impacts of climate change. Resilience to climate change makes it possible to cushion the climate shock and find opportunities for innovation and opening up new paths that increase the ability to adapt to these changes. The following activities will strengthen the climate change adaptation activities in AFR100 countries:

a) Production of several varieties of seeds that are drought resistant while increasing agricultural yields

National research institutes in AFR100 countries should be more encouraged to develop new varieties of seeds that are resistant to climate change. These varieties should be multiplied and disseminated widely at national level to increase agricultural production and resilience, improve food security

and reduce food imports. Drought tolerant crops are already produced in several AFR100 countries such as Kenya, Malawi, Zambia, Nigeria, Senegal, Niger, Sudan, South Africa, Namibia, Zimbabwe and Tanzania, to name a few.

b) Compliance with technical itineraries and the agricultural calendar

Compliance with sowing periods, fertilizer spreading and plowing helps to increase agricultural yields. It is unfortunate to note that agricultural extension has been reduced significantly in Africa as a result of Structural Adjustment Programs (SAP) imposed by the World Bank (WB) and the International Monetary Fund (IMF).

c) Diversification of Agricultural activities (agriculture, livestock, fishery and aquaculture, agroforestry, forestry, and floriculture) to increase resilience to climate change

Beyond the innovations made in agricultural production, livestock, fishery and aquaculture, rural communities should be encouraged, especially women and youth, to further diversify their sources of income by getting involved in the value chains of forest food products such as Sweet Detar or ditakh (*Detarium senegalense*), moringa (*Moringa oleifera*), baobab (*Adansonia digitata*), cashew (*Anacardium occidentale*), maracuja or Passion fruit (*Passiflora edulis*) etc., and floriculture. The Forestry departments in AFR100 countries should produce at scale several varieties of seedlings which will be distributed and planted by rural communities. However, to ensure a high survival rate of the trees planted, the Forestry Departments should sign contracts with the rural communities for the maintenance and monitoring of the trees and in return, give them a commercial use right to market the fruits of the trees while ensuring the preservation of the trees themselves. Thus, rural communities will have the right to consume and market the fruits of the trees planted to meet their basic needs, which will motivate them more for the monitoring and maintenance of the trees and will increase their capacity of resilience. Such an activity will contribute to both mitigation and adaptation to climate change.

d) Digital innovation to protect women producers to climate risk

Innovation Norway, United Nations Capital Development Fund (UNCDF) and UN women support digital projects in Mali and Senegal to strengthen the resilience of women producers to disaster risk and climate change.

PROJECTED IMPACTS OF FOREST LANDSCAPE RESTORATION AT LOCAL, NATIONAL, REGIONAL AND INTERNATIONAL LEVELS

a) Impacts at local, national and regional levels

At local, national and regional levels, the restoration of degraded forests and lands under the AFR100 initiative will achieve the following:

- i. Increase in forest cover and carbon sequestration to combat climate change;
- ii. Increase in biomass;
- iii. Increase in biological diversity through enriching species diversity, faunal species. The Ministry of Environment, Sustainable Development and Ecological Transition (MEDDTE) of Senegal through the Senegalese Agency for Reforestation and the Great Green Wall (ASERGMV), has engaged in massive planting of date trees in Northern Senegal due to favorable climate conditions. Through this strategy the country will increase its biological diversity and economic well-being by reducing the imports of dates and the development of the national markets. In Senegal, dates are consumed in large quantity during the fasting period of Ramadan.
- iv. Improvement in soil fertility [(see section 4, d) above], ecosystems and ecological functions of the forests;
- v. Improvement in air and water quality;
- vi. Reduction in dust and the health of populations, especially in the drylands of Africa;
- vii. Increase in employment opportunities for rural communities by providing green jobs to women, youth and marginalized groups;
- viii. Increase in incomes and prosperity in rural

areas;

- ix. Improvement in food security and nutrition;
- x. Contribution to healthy diets;
- xi. Reduction in gender inequality and more autonomy for women;
- xii. Reduction in the discrimination against marginalized groups.

b) Impacts at international level

- i. Reduction in global warming, flooding, droughts, forest fires;
- ii. Increase in biological diversity, ecosystem structure, function and services;
- iii. Improvement in population health and well-being;
- iv. Increase in carbon sequestration, biomass and carbon trading.

CONCLUSIONS

Climate change is a real phenomenon that affects the planet and will continue to threaten all continents and all regions of the world. For this reason, African countries, members of the AFR100 initiative through the restoration of degraded forests and lands are developing an important capacity of anticipation by implementing mitigation and adaptation programs to fight against the global warming of the planet. Through its impacts at local, national, regional and global levels, the restoration of degraded forests and lands contributes to combating climate change, improving biological biodiversity, reducing poverty and improving the food and nutrition security of populations.

Therefore, the collaboration between the AFR100 initiative and all the regional and global initiatives mentioned in this manuscript must be strengthened in order to obtain a win-win partnership with tangible environmental, social and economic benefits to improve human well-being and the health of the planet.



*Water Lillys in Mabamba wetland (Uganda).
Photo courtesy: Anthony Ochieng/Tony wild*

The future of wetlands in the face of climate change.

Wetlands, sometimes referred to as the kidney of nature, are defined by Ramsar as the “areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres” (Matthews, 1993). They are essential to the environment because they offer a variety of ecological services, including carbon capture and storage, control of flooding, water filtration (pollutants removal), and habitat for

a variety of species. Additionally, they provide array of good such as food, timber, etc, alongside the vast recreational services, natural beauty (therapeutical to humans), among other roles. Xu et al. (2019) affirm that 47% of the value of the global environment is represented by the overall values of wetland ecosystem services. The potential for wetlands to offer these invaluable goods and services, however, is anchored on the wetland’s health. A wetland’s location in the landscape, the ecosystem services it offers, and the activities that take place within its watershed (such development and agriculture) all have an impact on how healthy it is. According to Xu et al. (2019), the biggest influencing factors are pollution (54%), the utilization of biological resources (53%), the alteration of natural systems (53%), and agriculture and aquaculture (42%). It is important to note that a healthy wetland can provide all the ecosystem goods and services sustainably for a long period of time. This is provision of ecosystem goods and services is not true to unhealthy wetland, which can instead be a source for perpetuation of negative impacts of climate change. wetlands are, nevertheless, extremely susceptible to the effects of climate change. A crucial and intricate challenge is what will happen to wetlands in the face of climate change?

Scientists have projected a global net loss of at least 6000 square kilometres of wetlands by the year 2100. During the same period, global temperature is projected to increase by 1.5°C (Xi et al., 2021).



Ondiri wetland (Kikuyu). Photo courtesy: Anthony Ochieng/TonyWild

In my own view, an increase by 1.5°C is already very high and can trigger lots of changes to our ecosystems including wetlands, in terms of management, use, etc. Already there is vulnerability to climate change. Climate change is generating rising temperatures, changing precipitation patterns, and an increase in the frequency of extreme weather events like hurricanes and torrential downpours. These changes can lead to increased flooding, droughts, and erosion in wetland areas. Rising sea levels pose a particular threat to coastal wetlands. Freshwater wetlands can be harmed by saltwater intrusion as sea levels rise, changing their habitat and diminishing their capacity to perform crucial functions.



A reclaimed wetland along River Musokoto in Teso Central Sub county

Other possible effects

The natural hydrology of wetlands can be disturbed by variations in precipitation patterns. Wetland ecosystems and neighbouring towns may suffer because of severe droughts drying up wetlands and flooding caused by heavy rainfall. Many species that rely on wetlands for their habitat and migratory patterns may experience disruption due to climate change. This might put numerous plant and animal species in danger by causing biodiversity to dwindle/loss.

Unearthing key wetland potential

Because they store a significant amount of organic carbon, wetlands are crucial for carbon sequestration. By avoiding the release of this carbon dioxide into the atmosphere, wetlands can be preserved and restored to aid in climate change mitigation. Wetlands can be

crucial in assisting humans in adapting to climate change. They can provide natural barrier against storm surges, lessen floods, and preserve the purity of the water. Effective wetlands management can be essential for safeguarding vulnerable communities from climate-related calamities. Wetland preservation and restoration efforts are crucial. The implementation of land-use planning to stop the loss of wetlands, the creation of protected areas, and the restoration of degraded wetlands to their original conditions are all examples of conservation methods. It's worth noting that preservation of wetlands depends on national and international policies. Wetland management and conservation are greatly aided by programs like the Ramsar Convention, an international agreement for the preservation and sustainable use of wetlands. To better comprehend how wetlands are being impacted by climate change and to design efficient measures for their conservation and restoration, ongoing study and monitoring are crucial. It is crucial to involve local populations in wetland conservation and restoration activities. Better stewardship and sustainable management of wetland habitats can result from community engagement.

In conclusion, our ability to adapt to and minimize the effects of climate change while simultaneously actively protecting and restoring these crucial ecosystems will determine the future of wetlands in the face of climate change. In addition to being crucial for biodiversity and carbon sequestration, wetlands must be preserved if natural and human systems are to be resilient to the effects of a changing climate. In a nutshell, global commitment to enforcing implantation of the three pillars outlined in the Ramser convention 'wise use' of all wetlands, the designation and management of Wetlands of International Importance (Ramsar Sites), and international cooperation on management of shared resources and sharing of knowledge and information hold the key to the future of wetlands in the face of climate change.

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Dr. Cyrille Lazare,
Kenya Country Programme
Coordinator/Head, UNEP

How Plastic Production and Pollution is Accelerating Climate Change

“

Plastic pollution can harm marine life, which can disrupt the food chain and lead to changes in the ocean's ability to absorb carbon dioxide.

”



Unsanitary landfill full of bag global waste.

Climate change is the single biggest health threat facing humanity, and health professionals worldwide are already responding to the health harms caused by this unfolding crisis.

The Intergovernmental Panel on Climate Change (IPCC) has concluded that to avert catastrophic health impacts and prevent millions of climate change-related deaths, the world must limit temperature rise to 1.5°C. Past emissions have already made a certain level of global temperature rise and other changes

to the climate inevitable. Global heating of even 1.5°C is not considered safe, however; every additional tenth of a degree of warming will take a serious toll on people's lives and health.

While no one is safe from these risks, the people whose health is being harmed first and worst by the climate crisis are the people who contribute least to its causes, and who are least able to protect themselves and their families against it – people in low-income and disadvantaged countries and communities. The burning of fossil

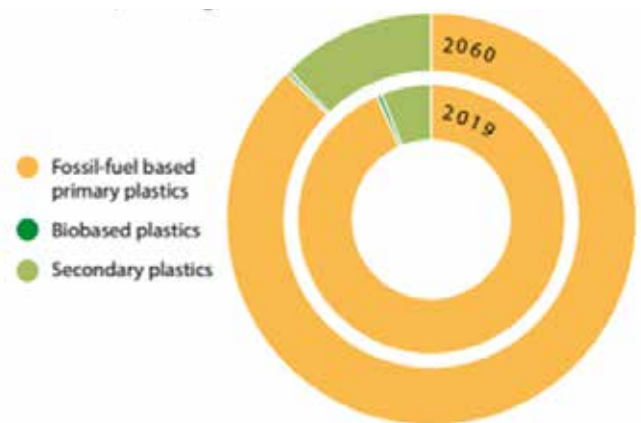
fuels, deforestation, and other human activities are releasing greenhouse gases into the atmosphere, which is causing the planet to warm. One major contributor to climate change is the production and pollution of plastics.

Every year, millions of tons of plastic end up in our oceans, rivers, and lakes. This plastic pollution not only harms wildlife, but it also contributes to climate change. When plastic is exposed to sunlight, it breaks down into smaller pieces called microplastics. Microplastics can be ingested by marine animals, which can then be eaten by humans. Microplastics can also absorb toxins from the environment, which can then be passed up the food chain. In addition, plastic pollution can also contribute to climate change by releasing methane, a potent greenhouse gas, into the atmosphere. Plastic pollution has become a global concern for ecosystem health and biodiversity conservation. Concentrations of plastics are manifold higher in the terrestrial system than the aquatic one. Micro/nanoplastics (M/NP) can alter soil enzymatic system, soil properties and also affect soil borne microorganisms and earthworms.

Climate change and plastic pollution are two of the most pressing environmental issues facing our planet today. Both are caused by human activity, and both have far-reaching consequences. Climate change is caused by the release of greenhouse gases into the atmosphere, which traps heat and causes the planet to warm. Plastic pollution is caused by the production, use, and disposal of plastic products. Plastic can take hundreds of years to decompose, and it can pollute our oceans, waterways, and beaches. Climate change and plastic pollution are interconnected in several ways. First, the production of plastic products releases greenhouse gases into the atmosphere. Second, plastic pollution can contribute to climate change by releasing methane, a potent greenhouse gas, when it breaks down. Third, plastic pollution can harm marine life, which can disrupt the food chain and lead to changes in the ocean's ability to absorb carbon dioxide.

Climate change and plastic pollution: A symbiotic threats to Human health

Climate change and plastic pollution are two of the most pressing environmental issues facing our planet today. Both are caused by human activity, and both have far-reaching consequences for human health. Climate change is the long-term alteration of temperature and typical weather patterns in a place. Climate change could refer to a particular location or the planet. Climate change may cause weather patterns to be less predictable.



Plastics production shares by type of plastics 2019 (inner ring) and 2060 (outer ring)

A region might experience lower or higher than average temperatures. Climate change may cause more frequent and severe weather events, such as storms, floods, and droughts. Plastic pollution is the accumulation of plastic objects in the environment. Plastic pollution can be found in all parts of the environment, including the ocean, land, and air. Plastic pollution can have several negative impacts on human health. One way that climate change and plastic pollution are linked is through the release of greenhouse gases. Greenhouse gases are gases that trap heat in the atmosphere, causing the planet to warm. Plastic pollution can contribute to the release of greenhouse gases when plastic is burned or when it breaks down in the environment. Another way that climate change and plastic pollution are linked is through the impact on human health. Climate change can lead to several health problems, including heat stroke, dehydration, and respiratory problems.

Plastic pollution can also lead to several health problems, including cancer, reproductive problems, and developmental disorders. The combination of climate change and plastic pollution poses a serious threat to human health. It is important to take action to address both issues to protect human health.

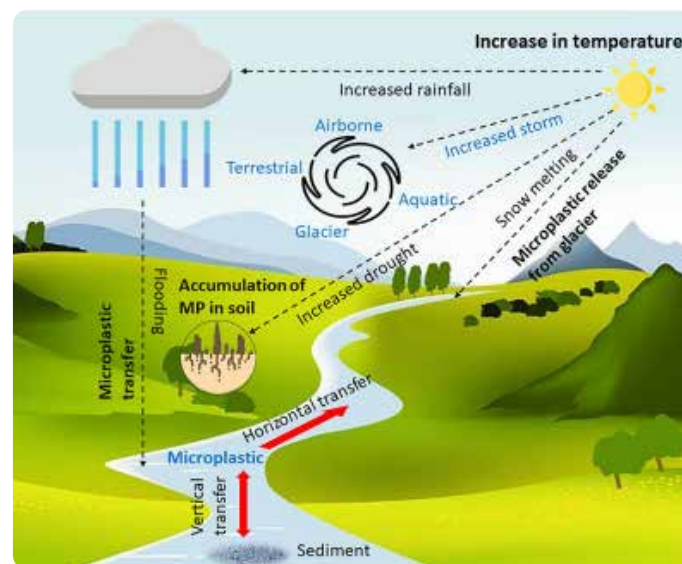
How are climate change and plastic pollution interlinked?

The production, conversion and waste management of plastics generate about 4% of total greenhouse gas (GHG) emissions. Of these, 90% can be attributed to the production and conversion stage of the plastics lifecycle.

Most plastics are currently produced with fossil fuels (93%). The amounts made from recycled plastics are 6% and the remainder are biobased plastics.

Substituting biobased plastics for fossil-based plastic production would lead to a direct GHG emissions decrease. However, the production of biobased plastics requires additional land leading to GHG emissions related to deforestation.

Waste management practices also affect the GHG intensity of plastics via their end-of-life treatment. In 2019, emissions from incineration accounted for 70% of total end-of-life emissions while those from recycling accounted for 22%. Recycling plastics reduces GHG emissions by lowering the demand for primary plastics, which have a higher carbon footprint.



Fate of microplastic under the impact of different climate change parameters

Conclusion: Need for an integral approach

To address climate change and plastic pollution, we need to reduce our reliance on fossil fuels and plastic products. We need to invest in renewable energy sources and sustainable materials. We also need to change our consumption habits and reduce our waste.

An integrated approach is needed to address climate change and plastic pollution. This approach must include a focus on reducing greenhouse gas emissions, increasing the use of renewable energy, and improving waste management practices.

One way to reduce greenhouse gas emissions is to transition to a clean energy economy. This means investing in renewable energy sources, such as solar and wind power, and making our homes and businesses more energy-efficient. Another way to reduce greenhouse gas emissions is to reduce our

reliance on fossil fuels. This means driving less, flying less, and eating less meat. We can also help to reduce plastic pollution by reducing our use of plastic products. This means bringing our own reusable bags to the grocery store, avoiding single-use plastics, and recycling plastic whenever possible. Finally, we need to improve waste management practices to ensure that plastic does not end up in our oceans or landfills. This means investing in recycling and composting programs and reducing the amount of waste we produce. By taking these steps, we can help to address climate change and plastic pollution and create a more sustainable future for our planet.

The production and pollution of plastics is a major contributor to climate change. However, there are a number of things that can be done to reduce plastic production and pollution, and help mitigate the effects of climate change. By working together, we can create a more sustainable future for our planet.



KENYAN BIOMES AND THEIR CONTRIBUTION TOWARDS CLIMATE CHANGE ADAPTATION AND MITIGATION

A biome is a large span of land characterised by its unique climate and soils which influence the flora and fauna. In Kenya, the major biomes range from forests, woodlands and grasslands, wetlands, and semi-deserts. Forests like Mau Forest, Aberdare Forest Ranges, Nandi Forests and Marsabit Forest, consist of a continuous stand of trees, which may attain a height of four metres or more, with tree crowns touching or intermingling. Woodlands are swaths of land with an open cover of trees, their crowns not forming a thickly interlaced canopy.

They may also have scattered evergreen shrubs though these are not conspicuous, with perennial grasses and herbs. Examples include Boni-Dodori. Grasslands like Maasai Mara ecosystem, Laikipia, Amboseli – Tsavo Ecosystem and the Athi-Kapiti Plains are tracts of land predominantly covered with grasses and other herbs, with occasional grouped or scattered, trees and bushes. Grasslands used for wildlife conservation and tourism, human settlement and industrial development, livestock husbandry and farming.

Wetlands which form the aquatic biomes, range from freshwater and marine ecosystems; are major sources of water for human domestic, industrial and wildlife use. These ecosystems offer opportunities for fishing, tourism, hydroelectricity generation and transport, as witnessed in Lake Victoria, the Rift Valley Lakes, River Tana, the Indian Ocean and associated coral reefs, and estuaries. Semi-deserts, like Chalbi desert consist of bare ground with low bushes and stunted trees, mostly spiny or thorny, succulent plants (like cactus), and other herbs.



Mount Kenya ecosystem

Importance and Contribution of Biomes in Climate Change

Biomes are critical in the sequestration of atmospheric carbon (above and below ground biomass). Through the process of photosynthesis, plant life sequesters the atmospheric carbon dioxide, a major greenhouse gas (GHG) into simple sugars and stores it within its biomass. This reduces the depletion of the ozone layer. Biomes such as forests, woodlands and wetlands contribute to modification of micro-climates. They can influence the soil moisture, ambient temperature, and winds of the atmosphere.

Biomes also contribute to the reduction of climate related and natural disasters. Mangroves found in marine areas, can reduce the impact of extreme climate induced tsunamis and hurricanes as they will buffer the land-sea ecotones. In so doing, they can potentially reduce the loss of lives and destruction of infrastructure. Wetlands in form of marshes and bogs, can reduce flash floods and storm water detention attributed to extreme climate. They allow the sediments in water to settle through the process of biofiltration, thus provide clean and safe water for various uses. Conversely, in intact and well managed forest ecosystems, as extreme rainfalls pour, the trees

allow slow yet steady percolation of rainwater into the soil. This contributes to charging underground water aquifers and conversely enables water security during incidents of drought. Plant roots also reduce incidents of soil erosion attributed to the heavy rains and winds, by holding by holding the topsoil in place and controlling the flow of water.

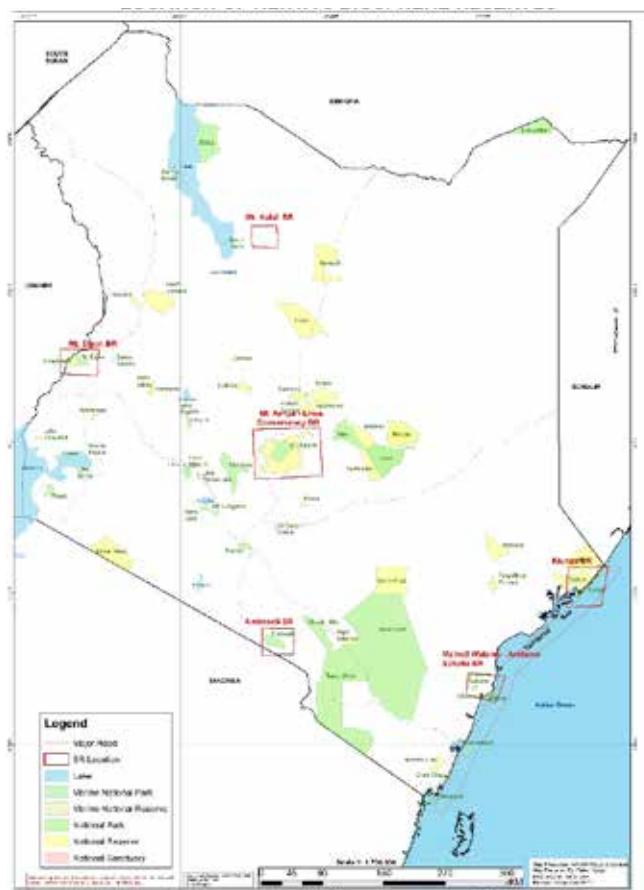
The biomes also contribute to food security and decent livelihoods, especially in the face of climate change. These biomes have flora and fauna that are accustomed to the weather and produce food of humans and livestock. In the coastal areas of Kenya for example, coconuts, dates, and cashew-nuts. In riparian areas, communities can sustainably produce rice, yams, and arrowroots, while also fishing. In the ASAL regions, they can engage in apiculture (bee farming); fruit, grain, and pulse production; and ranching. The production of these food crops provides alternative income generation for the communities, thus allow them to have decent livelihood and dignity, especially for youth, women, the elderly and marginalised community members.

Biomes also significantly contribute to the reduction of climate related human resource conflicts and human-wildlife conflicts, including spread of climate related zoonotic diseases. In Amboseli (Kajiado), rangeland and wetland biomes are used by livestock rearing communities and wildlife as dry season grazing areas and watering points, especially in the Isinet and Kimana. These interconnected biomes also contribute increasing dispersal areas of livestock and wildlife, thus ensuring genetic and species diversity, critical to climate change adoption and in line with the Aichi Sustainability Targets. This has contributed to biodiversity conservation, and averting completion for the scarce resources.

Finally, biomes act as critical experiential knowledge labs championing environmental education and connection-to-nature. These allow from interdisciplinary and inter-generational mainstreaming of climate advocacy; promoting critical thinking; and community driven innovative solutions.

Sadly, most of these biomes experience poor management, exhibited in a phenomenon called “tragedy of the commons”. The tragedy of the commons refers to a situation in which individuals with access to a public resource act in their own interest and, in doing so, ultimately deplete the resource. This is as a result of lack of connection to nature; over-exploitation of natural resources and resource depletion, without considering their capacity to regenerate; widespread wanton ecosystem mismanagement; increased consumption patterns; increased human populations; poor waste disposal and industrialization; to increased demand for food production.

In a bid to address these current and emerging challenges affecting biomes in Kenya, KNATCOM in collaboration with state and non-state actors is giving leadership in the effective and sustainable management of these critical yet fragile ecosystems. Though the UNESCO Man and Biosphere Programme, Kenya has designated six (6) biosphere reserves of global importance, which cut across the biomes of Kenya. These are Mt. Kenya - Lewa Conservancy Biosphere Reserve (BR); Mt. Kulal BR; Malindi-Watamu-Arabuko-Sokoke BR; Kiunga BR; Amboseli BR; and Mt. Elgon Transboundary Biosphere Reserve, that straddles between Kenya and Uganda. The Biosphere reserves achieve their roles by advocating for interdisciplinary approaches to understanding and managing changes resulting from social and ecological systems. It expressly calls for the involvement of local communities and all interested



Map of Kenya Biosphere Reserves

stakeholders in planning and management. Additionally, the sites support mitigation and adaptation to climate change and other aspects of global environmental change.

Conversely, KNATCOM together with partners, through the Natural Science Programme, is spearheading the mainstreaming of climate knowledge in formal education institutions; and promoting green building designs, as envisage in the Kenya Green University Network. It is also aggressively engaging communities, partners,

biosphere managers and youth in ensuring ecological integrity and ecosystem resilience within these biomes through capacity and skill development in rehabilitation of rangelands (seedbed establishment, indigenous tree-planting and grassland re-seeding programmes); documentation of indigenous knowledge critical in the preservation and suitable use of these biomes and their derivative products; advocating for adoption of climate-smart agriculture, energy efficient cook-stoves and sustainable tourism among others.

In lieu with its mandate, it commemorated climate and environmental related days and promotes the UNESCO Young Researcher Award, an award that supports youth research on ecosystems, natural resources, and biodiversity. In conclusion, the programme contributes to national, regional and global policies related to climate change adaption and mitigation; biodiversity and water conservation; disaster risk reduction; landscapes and seascapes.

DR. James Gichiah Njogu
AG C.E.O KNATCOM-UNESCO and Olewe Brian Waswala

Impact of Climate Change on Kenyan Marine Ecosystem

Earth's climate has changed throughout history, with several cycles of ice ages and warmer periods having been scientifically proven. These changes have been slow, involving warming and cooling occurring over hundreds of thousand years, driven largely by changes in earth's orbit. The current era of climate change is however unique as it is characterized by an unprecedented rate of warming driven by human activities since the mid-1800s. Increased industrialization and urbanization are continuously producing greenhouse gases that create a blanket effect by trapping heat leading to a warmer atmosphere, land and ocean.

As the planet's climate continues to evolve at an alarming rate, its impacts on vulnerable marine critical habitats (coral reefs, mangroves and seagrass) is becoming increasingly evident. From the melting of glaciers, excess emissions of carbon dioxide (CO₂), changing weather patterns, and increase in sea surface temperatures, decreasing oceans pH to excess warming of water bodies among others. Kenya is endowed with stunning coral reefs, vibrant marine life, rich biodiversity, and productive ecosystems that are a crucial part of not only Kenya's cultural heritage but also its economy. At a faster pace recently, climate change is affecting the marine



*A section of destroyed mangroves in Lamu.
Source: Image by Tony Karumba for Business Daily*

environment, causing numerous ecosystem alterations. The impacts of climate change on Kenya's marine critical habitats cannot be ignored due to their significant implications on coral reefs, mangroves, seagrass meadows, fish populations, local and national economy.

CORAL REEFS

Corals are marine animals living in a symbiotic relationship with algae that assist them to capture the sun's energy through photosynthesis. With this relationship, corals build reefs that are a haven for many species of fish and other marine animals. However, this relationship is highly vulnerable to prolonged increased water temperature occasioned by climate change due to the collapse of symbiotic relationship, loss of algae leading to coral bleaching and eventual mortalities, as observed on several occasions in Kenyan (Muthiga *et al.*, 2014). Globally, coral reefs are projected to decline by 70-90% by 2050 if the current rate of warming is sustained (IPCC, 2018).



A Degraded coral reef. Image by Mark Conlin/Alamy and Tim Gordon, University of Exeter

Warmer oceans are also a recipe for storm surges and changing storm patterns (stronger and more frequent storms). Coral reefs are constantly exposed to these powerful storms with little chance for recovery, ultimately leading to mortalities. Additionally, a changing climate accompanied by changes in precipitation patterns such as increased rainfall results in a large inflow of freshwater laden with huge loads of sediment and pollutants leading to localized changes in salinity, algal blooms and sediment deposition which may smother coral reefs and reduce

light penetration. Similarly, rising sea levels mobilize sediment which settles on and smothers coral reefs



A healthy coral reef. Image by Mark Conlin/Alamy and Tim Gordon, University of Exeter

The ocean is the biggest sink of anthropogenic CO₂ which lowers the ocean pH over time. A study by McClanahan *et al.*, (2017) demonstrated how climate change-induced ocean acidification hampers reef growth and calcification in Kenya. Ocean acidification impairs coral's ability to construct and maintain their calcium carbonate structures. The combined effect of ocean acidification and ocean surface warming degrades

due to increased coral bleaching, reduced rates of calcification and survival, and high susceptibility to disease. A study by Ogali, (2022) revealed that bleaching and ocean acidification negatively affected the coral reef cover resulting in a decline of more than 30% between 2000 and 2021.

MANGROVE FORESTS

Mangrove forests provide goods (wood, fuel, etc.) and services (shoreline protection, carbon sequestration and habitat provision) that are vital for the coastal communities. However, this critical ecosystem has not been spared by climate change. Research by Bosire *et al.*, (2017) reported that rising sea levels and intensified storms coupled with anthropogenic activities have resulted in the degradation and loss of mangrove forests along Kenya's coastline. Sea level rise and reduction in sediment can affect the distribution and growth of mangroves with socio-economic impacts that may include flooding, coastal erosion and increased storm surges and related loss of coastal properties (Field, 1995). Over the years, evidence on the response of mangroves to changes in sea level rise and elevated temperatures of El Nino, has been documented. For instance, the rise in sea level and warm El Nino water have resulted in loss of several hectares of mangroves in Kenya.

“ Sea level rise and reduction in sediment can affect the distribution and growth of mangroves with socio-economic impacts that may include flooding, coastal erosion and increased storm surges and related loss of coastal properties ”

SEAGRASS

Seagrasses are marine flowering plants that live completely submerged underwater. They serve as feeding and nursery habitat for important fish species, regulate water column dissolved oxygen, modifies their physical and chemical environments, and reduce suspended sediments, chlorophyll, and nutrients in the water column. Their root systems



Healthy seagrass at Kangaroo Island Natural Resources. Source: Image by Takvera

bind and stabilize bottom sediments while their leaves baffle currents and improve water quality by filtering suspended matter. Water clarity controls the amount of light reaching the seagrass and therefore determines the depth at which they are found and their distribution.

These flowers are impacted by climate change due to turbidity related to flooding events. Increased temperatures also alter the growth rates and other physiological functions of seagrass affecting their productivity and species composition (Koch et al. 2015).



Unhealthy seagrass at Kangaroo Island Natural Resources. Source: Image by Takvera

FISH POPULATIONS

Fish populations are also susceptible to climate change impacts, including shifts in distribution, abundance and species composition. Mwaura et al. (2018) reported that rising water temperatures and modified ocean currents influenced the fish distribution and migration patterns in Kenya resulting in reduced fish catches and changes in fishery productivity.

ADAPTATION AND MITIGATION TO CLIMATE CHANGE

The Government of Kenya has been addressing climate change impacts over the year focusing on disaster risk reduction, humanitarian action, preparedness and response actions, including efforts to address drought through the Department of Special Programmes for floods and other disasters. Kenya has a national adaptation plan with the aim of enhancing climate resilience and some of key activities targeting marine life and coastal communities. National efforts by governments to mitigate the impacts of climate change (lessening severity, preventing or reducing the emission of greenhouse gases) include;

- a. Reducing greenhouse gas emissions e.g illegalizing open burning
- b. Awareness through school curricula
- c. Climate proofing of coastal development plans
- d. Investing in renewable energy
- e. Protecting coastal forests
- f. Electrification of industrial processes.
- g. Efficient means of transport implementation: electric public transport (electric motorbikes), bicycles, shared cars

However, as climate change risks and vulnerabilities increase, and communities have also tried bringing

in additional efforts and adaptation measures to address future vulnerabilities and enhance community sustainable development. Some of the community mitigation and adaptation measures to climate change include;

- a. Carbon tax and emissions markets.
- b. Building of seawalls and reallocation of building to higher grounds to adapt to the sea level rise.
- c. Dune management in Sabaki.
- d. Coral reef restoration.
- e. Mangrove restoration to build shoreline protection.
- f. Early warning systems
- g. Change of lifestyle – limiting food waste, recycling packaging items, use of public means etc.

CONCLUSIONS AND RECOMMENDATIONS

1. Collaborative implementation of climate change policies and practices by national and regional governments, communities, and policymakers.
2. Enhanced efforts by coastal county governments in Kenya and research organizations to expound on the scientific knowledge base while simultaneously implementing sustainable targeted solutions to ensure that the socio-economic benefits of the coral reef ecosystem are sustained.
3. Investing in the well-being of systems that act as carbon sinks such as forests and ocean

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Carbon Offsets

A New Form of Colonialism?

David John Bwakali
Executive Director, Environmental Africa Trust

Deep in Voi Constituency, Taita Taveta County, Kasighau Community members are enjoying water in this otherwise dry area. Carbon credits are responsible for this water. Wildlife Works, an international NGO that operates in the county usually sells carbon credits on the international market. They use part of the proceeds on community projects like the water project. This carbon offset arrangement is an integral part of their Kasigau Corridor REDD+ project in Kenya.

Despite the tangible water benefit, most community members in this area are not able to explain to you what carbon offsetting

entails and exactly how it benefits their community. These community members are not alone in their carbon offsetting ignorance. Indeed, carbon offsetting remains one of the most cryptic arenas of the environmental world.

Carbon offsetting is simply a way for individuals or organizations, to “compensate” their proportion of carbon emissions by investing in carbon reduction projects. Over the last decade, carbon offsetting has become a global, multibillion-dollar industry. It has been embraced by multinationals like airlines, oil companies and fast-food chains together with governments. They regard it as a way of claiming seemingly reducing their carbon footprints.

While the thinking behind this approach is noble, even commendable, it's also like paying someone else to clean your mess. For instance, participating airlines can then continue with wanton emissions just because they are now paying for communities in Africa to plant trees, engage in afforestation and a host of other conservation ventures. The fact that the airline is purchasing carbon credits, doesn't result in less emissions. How is this helpful to the environment?

Clearly, carbon offsetting can create a moral hazard by allowing companies to continue emitting greenhouse gases while relying on offsets for mitigation. Offset projects should be seen as complementary, not a substitute for emissions reduction efforts by companies.

It is against this backdrop that conservationists in Africa are now posing the question, are Carbon Offsets a new Form of Colonialism?

The perception of carbon offsetting as a form of contemporary colonialism in Africa is a complex issue that stems from various concerns and criticisms.

For starters, carbon offsets are built on unequal power dynamics. Indeed, carbon offset projects often involve multinational corporations and wealthy countries investing in projects in Africa, which further perpetuates power imbalances.

The best way for polluters to exercise accountability is to either stop polluting or drastically reduce their pollution.

As a case in point, in early September 2023, an Emirati coalition announced a \$450 million commitment to buy carbon credits generated in Africa. This was revealed during the inaugural Africa Climate Summit that was held in Nairobi.

Amongst those opposed to this carbon offsetting pathway is Greenpeace.

In response to the Emirati coalition announcement, Thandile Chinyavanhu, Greenpeace Africa climate and energy campaigner said that, 'it is regrettable that the Africa Climate Summit is becoming a bazaar

for carbon credit speculators and propagandists that serve to greenwash rather than reduce harmful emissions. They are risky diversions from real climate and biodiversity action that requires ending fossil fuel expansion and industrial destruction of our ecosystems.'

Herein lies the quagmire of carbon offsetting. They give whoever is purchasing the carbon credits undue power. In so doing, they don't foster equitable partnerships where African nations have a stronger say in project development and decision-making.

Carbon credits are sold on a free carbon market, which is at first glance, a good thing. However, carbon offset projects can result in unintended consequences like land grabbing, displacing local communities and negatively impacting their livelihoods.



The perception of carbon offsetting as a form of contemporary colonialism in Africa is a complex issue that stems from various concerns and criticisms.



In March this year, Simon Counsell and Survival International released a report that provided damning evidence on carbon offset projects in northern Kenya. According to the report, a carbon offset scheme makes millions from Indigenous land in Northern Kenya. Because the project relies on major changes to the way in which the area's Indigenous pastoralists graze their animals, it is potentially undermining the livelihoods of thousands. This further proves the opaque nature of carbon offsets projects.

Another factor that lends credence to the 'new form of colonialism' argument is the lack transparency that seems inherent in many carbon offset projects. How much money do carbon traders make on the carbon market? How determines the worth of the carbon credits they sell? Who determines the percentage of proceeds that goes to local communities? Who

verifies that funded conservation projects have indeed offset respective carbon emissions?

There are simply no clear answers to these questions which further stifles transparency. As such, the opacity surrounding carbon offset projects makes it challenging to verify their true environmental impact. Further, all conservation projects, especially carbon offset projects should respect land rights and prioritize the well-being of local communities, with their informed consent. This is simply not the case in most carbon offset projects here in Africa.

For carbon offset projects to shed the colonialism tag, they must establish transparent monitoring and reporting mechanisms to track the real emissions reductions achieved. In this regard, thorough environmental impact assessments should inform the choice of projects that have minimal negative effects on local ecosystems.

Systematic monitoring should also track to what extent local communities have benefited directly from proceeds of carbon credits sold.

In many cases, the local communities hosting carbon offset projects experience few direct benefits, with profits flowing out of the region. Many community 'benefits' are restricted to peripheral projects like classroom construction, shallow well construction and the like. These are merely crumbs falling from the table. Real benefits should tackle critical issues like jobs. On this score, if a carbon offset project isn't resulting decent, well-paying green jobs, then it has already failed the test of community benefits.

On a larger scale, some projects, such as afforestation, may require significant water and land resources, potentially exacerbating resource scarcity in already vulnerable regions. Furthermore, afforestation and reforestation projects can sometimes prioritize monoculture tree plantations over diverse ecosystems. Conservation isn't about domination of a particular species, but the flourish of biodiversity and replenishment of native ecosystems.

That's why community consultations must be fully comprehensive, taking on board different segments of the community. They should also integrate national and county laws, ensuring that they are conducive for particular carbon offset projects.

Embedded in these community consultations should be clear safeguards from market volatility. Carbon offset projects often have limited lifespans, raising concerns about their ability to deliver lasting environmental benefits. That's why offset projects must be developed with long-term sustainability in mind, ensuring that they continue to sequester carbon and provide other ecological benefits after initial commitments expire.

It will defeat the purpose to offer communities promises that are reliant on future carbon markets. Indeed, carbon markets' fluctuating prices can result in unpredictable revenues for offset projects, which would adversely impact communities whose consent was pegged on definitive revenue figures. Offset projects should therefore explore options for stable, long-term financing to ensure project continuity.

Moving forward, there must be elaborate verification mechanisms for carbon offset projects. In the absence of such verification mechanisms, questions on project eligibility will abound. That's why African governments and stakeholders must strengthen third-party verification processes to ensure the credibility of offset projects.

To address these concerns and mitigate the perception of carbon offsetting as contemporary colonialism in Africa, it is essential to prioritize the interests and well-being of local communities, improve transparency and accountability, and select offset projects with a strong focus on sustainability and biodiversity. Additionally, promoting broader climate justice principles and equitable distribution of the benefits from offset projects can help ensure that carbon offsetting contributes positively to climate resilience, job creation and sustainable development in Africa.



JOINING THE DOTS: CLIMATE CHANGE AND THE WASH SECTOR

Buffaloes running towards a water bowser in Tsavo-West national park.
Photo source: (<https://phys.org/news/2017-03-kenya-drought-stricken-wildlife.html>)

The United Nations General Assembly in its Resolution 64/292 bestows the right to adequate, clean, and safe drinking water, and to reasonable sanitation standards to all global citizens.

Continentially, African Commission on Human Rights in Resolution 300, points out that proper sanitation services and safe drinking water is indivisible from other human rights as right to liberty and security, participation in decision making, shelter and education. The same rights have been upheld by the Kenyan Constitution under Article 43. However, the gains made towards realization of this fundamental right are likely to be downgraded by the increasing impacts of climate change. Moreover, heavy rainfall, flooding, high temperatures and drought events modify the distribution and increase the susceptibility to diarrheal infections such as intestinal worm infections, cholera, dysentery typhoid and polio.

Climate change affects the water, sanitation, and hygiene (WASH) use and practices particularly among the most vulnerable. This underpins the strong interlinkage between Sustainable Development Goals (SDGs) 13 and 6. SDG 6 seeks to ensure accessibility of adequate, affordable, safe drinking water and reasonable sanitation for all, while SDG 13 recognizes

that climate change is undeniably a great threat to the entire civilization and an urgent action is needed to combat its impacts and build resilience against it by the year 2030. This is because, climate change portends a great threat to sanitation infrastructure and systems, clean water networks and handwashing facilities. Here is the snippet of this interlinkage:

1. CLIMATE CHANGE IMPACTS ON WATER SERVICE DELIVERY

Climate change affects water resources by impacting on the timing, variability, quantity, form, and intensity of the precipitation. These impacts exacerbate water-related hazards that lead to several social, economic and ecosystem detriments to human livelihoods. Increased evaporation rate reduces water supplies whose worst consequence is experienced in arid and semi-arid lands such Mandera, Garissa, Wajir, Taita-Taveta and Baringo counties. In these regions, thousands of community members converge under the blistering sun at the village borehole with everyone wanting to quench the thirst of their animals

first before thinking of their dehydrated bodies. The situation leads to increased water-borne infections as people drink water directly from the livestock troughs.

Besides, the drought brings tension and conflicts over ecosystem-based limited resources. Community members are left in dire need of humanitarian aid, while the water bowzers often supplying the unserved and underserved residents of the informal settlements are rerouted to supply water in the national parks and save the dying animals.

2. CLIMATE CHANGE IMPACTS ON SANITATION SYSTEMS

Climate change threatens the existing sanitation service arrangements, infrastructure, and technologies as well as efforts to increase service for 5 million Kenyans estimated to be practicing open defecation. The heavy precipitation causes physical damage to the sanitation infrastructure and interferes with the collection, containment, emptying, transportation, and safe reuse or disposal of human waste.

On the flipside drought limits water availability for the piped sewer systems which increases the pollutants concentration in the wastewater. Concentrated contaminants have a greater health risk when discharged untreated into the environment. For the coastal communities, the rise in sea levels is predicted to increase flooding rendering on-site sanitation technologies such as septic tanks, composting toilets, Eco-san and pit latrines non-functional as they are filled by water. Thus, sanitation technology choice is a critical element that needs to be included in the climate resilience discussions.

3. CLIMATE CHANGE IMPACTS ON HYGIENE PRACTICES

It is extremely difficult to maintain proper overall hygiene and menstrual hygiene management in a water scarce setting. Unfortunately, health, psychological wellbeing and empowerment of girls and women are all dented by improper menstrual hygiene. The menstruation management during climate emergencies is often challenging for the females in displacement camps due to inadequate menstrual hygiene management resources and

supplies such as laundry soaps, tampons, pads, and pain relief items. The scenario is exacerbated by the suspension of menstrual health initiatives during climate disasters. For proper overall hygiene, WHO recommends 100 litres of water per person per day, however, due the growing water scarcity, unpredictability and inequitable access, most households will be forced to modify their water consumption patterns and by extension their overall hygiene practices.

About half of the world's population have access to basic handwashing facilities with soap and water, however this availability does not translate into washing hands at critical times all the time. This reality is likely to aggravate with the changing climate. Studies also show that increased water temperatures are linked to skin damage which may contribute to bacterial colonization and more handwashing non-compliance.

The Underfunding in WASH sector

The WASH service provision receives lower financial allocation in the national budgets as compared to other sectors such as health, infrastructure, security, and education. The Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) report prepared by WHO and UN-Water in 2022, indicates that over 75% of countries do not have sufficient budgetary allocation to implement their WASH projects making realization of SDG 6 delusional by 2030 (WHO 2022). In Kenya, the government needs \$ 12.9 billion to expand and improve WASH services, yet the current government budget is \$5.6 billion, leaving a gap of \$ 7 billion (USAID 2021). In Kisumu, the county government allocates an average of 2.8% of the County's budget to water and sanitation sectors (Practical Action 2021). Climate related high-risk hygiene practices will continue to confine the vulnerable in a vicious cycle of loss of income, environmental degradation, poor health, malnutrition, and loss of income. Thus, improvement in WASH funding is essential for building poverty eradication, building prosperous and peaceful societies and sustainable development.

The Panacea: Climate financing for WASH services

The African Climate Summit held in September yielded Nairobi Declaration to be fronted at the 28th session of the Conference of Parties (COP28) in United Arab Emirates as the Pan-African position. The Declaration has strong suggestions on climate change finance restructuring as per the principle of common but differentiated responsibility. African countries bagged \$23 billion from private investors, development banks and philanthropists for mitigation, adaptation, and green projects. The question one would bother to ask is how much of this financial commitment will be channeled to WASH services. Statistics from Climate Policy Initiative show that total climate finance has reached a new high of \$640 billion in 2020, yet mitigation finance is still very low at 2.75%.

Unfortunately, accessibility of climate mitigation and adaptation financing for WASH policies, programmes and projects has been a challenge to most civil societies and governments from the global south due to several procedural, design and systemic blockades. Climate finance is characterized by complexities that the WASH institutions have not tapped into. The institutions appear not to be proactive in resource mobilization, planning and development of a coherent approach to building climate-resilient WASH services. There is also serious concern among international development agencies that the most vulnerable peoples aren't "climate finance ready" and suggest the need for considerable institutional support to acquire, utilize and manage the funds. According to Water for Women (2023) three key barriers to accessibility of climate financing for WASH services in among the global south countries includes: (1) Lack of agreed and financially feasible business

The Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) report prepared by WHO and UN-Water in 2022, indicates that over 75% of countries do not have sufficient budgetary allocation to implement their WASH projects making realization of SDG 6 delusional by 2030 (WHO 2022).

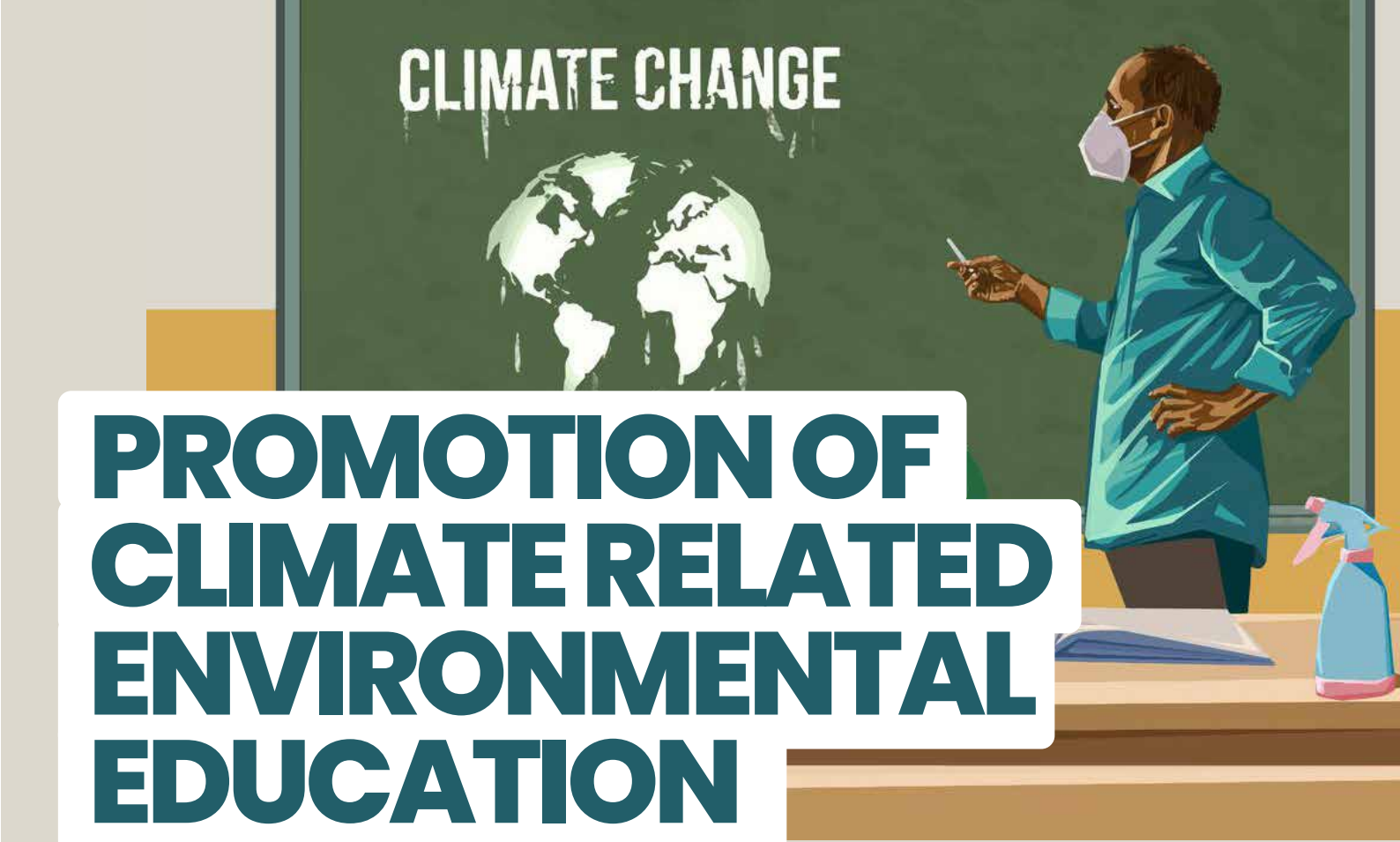
model for WASH and the broader adaptation ecosystem, (2) Absence of standardized methodologies to measurements of climate change adaptation and resilience impact of WASH i.e., Impact investors and donors are keenly interested in understanding the returns on their investments, and (3) Lack of time for field testing interventions associated with the evolving climate change science knowledge and associated donor expectations. To increase secure international climate finance for WASH services, WaterAid (2017) suggests that African governments should:

- a. Formulate a WASH sector policy on climate change that gives a roadmap for adaptation and resilience. Formulation of WASH resilient policies and programs
- b. Incentivize inter-sectoral cooperation on WASH issues and climate change. This is because wash services cut across several sectors.
- c. Prioritizing the development of funding proposals that tackle WASH and climate change

Conclusion

This article highlights the intricate relationship between climate change and water, sanitation, and hygiene. It points out that climate change modifies water resources by impacting on the timing, variability, quantity, form, and intensity of the precipitation. These alterations change a household's water consumption patterns and their overall hygiene practices, a recipe for health complications. Moreover, climate induced disasters and water insecurities affect the sustainability of water and sanitation service provisioning and needs an increase in investment in this by now strained sector. The article suggests the need for formulation of climate-resilient WASH programmes to make the most vulnerable community "climate finance ready".

Dr Gordon Ocholla
Environmental Scientist



CLIMATE CHANGE

PROMOTION OF CLIMATE RELATED ENVIRONMENTAL EDUCATION

Climate change is one of the pressing issues in the 21st century. It has been classified as a global pandemic in the present time. Science has it that climate change is majorly propelled by the release of greenhouse gases into the atmosphere. These gases trap heat which in turn causes the planet to warm-up. Human beings' activities are the major contributors of greenhouse gases in the atmosphere. The drastic increase of the harmful gases can be dated back to the industrial periods of 1960's when human kind increased its dependence on fossil fuels to drive industrial development. It is during this era that humans also started to over exploit the natural resources for the purpose of acquiring raw materials for the industries. Considered as a global pandemic, humanity ought to find a solution to climate change.

The levels of greenhouse gases in the atmosphere have led to a drastic shift in climatic patterns. The resulting effects carry devastating consequences to the planet and its inhabitants. Global temperature shifts have resulted to occurrences such as; sea level rise, flooding along the coastal cities which

have resulted to displacement of millions of people. Extreme weathers such as hurricanes, floods, severe droughts have become more common. The global food supply has also been threatened since the conditions (temperature and rainfall) at which crops grow have been destructed. Extinction of crops and animals has also become a real possibility, all as an attribute of the change climate.

CLIMATE CHANGE EDUCATION

Climate change education is a form of education that aims to address and develop effective responses to climate change. It is a broad and interdisciplinary field that encompasses a wide range of topics, including the science of climate change, its impacts on society and the environment, and strategies for mitigation and adaptation.

The United Nation Framework Convention on Climate Change (UNFCCC), the Paris Agreement and the associated Action for Climate Empowerment (ACE) agenda call on governments to educate, empower and engage all stakeholders and major groups on policies and actions relating to climate change.

Climate change education is resourceful for various reasons. It enables individuals to understand the causes and effects of climate change, which is essential for making informed decisions about how to address it. Climate change education also helps people to develop the knowledge, skills, values and attitudes they need to take action on climate change, both in their personal lives and in their communities. It can also enable individuals to create a more informed and engaged citizenry that is prepared to support climate policies, action and initiatives.

IMPORTANCE OF CLIMATE CHANGE EDUCATION

Over time, education has been used as a tool to create awareness in the society. It is considered as an agent that brings about change by instilling new knowledge, skills and attitudes thus encouraging participation by the learners. There are many ways through which educating the public on climate change can be achieved. Climate change education can be delivered in a variety of settings, including formal education institutions, non-formal education settings, and informal settings.

Climate change Education programs can be delivered through formal education, such as in schools, colleges and universities by integrating climate change issues into the curriculum across a range of subjects, including science, social studies, geography, and economics. Courses related to climate change can also be delivered in the tertiary institutions. Climate change education can also be delivered in a non-formal education setting, such as museums, community centers, and workplaces. This form of education can be delivered through short courses, workshops, seminars, and other educational programs to enhance adult and youth literacy and out of school children or youth. They include programs on life skills, work skills, and social or cultural development. In addition, Climate change education can be delivered

through informal setting, such as through public awareness campaigns, documentaries, and social media and family conversations.

Climate change education can help to raise awareness of climate change and encourage people to take action. It is important that in conducting the education, the public is facilitated with accurate information about climate change. Encouraging general public participation should more importantly be emphasized so as to acquire the best results. For the public to understand the importance of slowing down the pace at which climate change is taking place, the science needs to be clear for them. Many

people are however not aware of the basic science of climate change. There are still a lot of misconceptions surrounding the science of climate change. Education in this case boosts the communities' understanding on the causes, risks and solutions to climate change.

The public is the main contributor of the highly recorded carbon footprint. To address climate change, the single most important action is to reduce the emission of greenhouse gases

into the atmosphere. Education helps people to make informed choices about their lifestyle and consumption habits, and to make changes that reduce their impact on the environment. While Young people are the most likely to be affected by the impacts of climate change, they are also the most likely to be the leaders of tomorrow. Education lays a perfect background to empower young people to learn about climate change, to take action to reduce their own impact as well as to advocate for climate action.

Given that Environmental and climate educators have taken the initiative to ensure that educational programs are catered for, learners or the public also have a vital role to play to ensure there are best outcomes at the end. The public, who are the learners, ought to take the initiative to learn more

Education helps people to make informed choices about their lifestyle and consumption habits, and to make changes that reduce their impact on the environment.

about climate change, its impacts and how their input at individual level is of importance. Educating one's self about climate change is likely to result into more practice. There are many resources available online and even in public libraries that help one to learn about the science of climate change, its impacts, and best practices to slow climate change.

Reducing the global carbon footprint is the major stepping stone to ensuring that the planet heals from climate change. There are many ways to reduce carbon footprint that learners of climate related environmental education can embrace, such as driving less, using less energy, and eating less meat. There are also many products and services available that can act as a guide to living a more sustainable lifestyle.

Climate activism has become a more popular trend during this era of climate change pandemic. To demonstrate proper understanding of climate matters, the learners should get themselves involved in climate activism. This is achieved by joining a climate group, volunteering for a climate organization,

or contacting elected officials on important inputs to improve climate policy.

One way of showing a clear understanding and interest in something is by being ambassadors of the subject matter. Sharing new concepts on climate change matters with others enhances participation towards solving the pending issue.



Climate change education can be delivered through informal setting, such as through public awareness campaigns, documentaries, and social media and family conversations.



Making Climate Education Effective despite the prevailing Barriers

1. Climate education should start at a young age, when children are more likely to be receptive to new information.
2. Climate education should be relevant to people's lives. This means talking about the local impacts of climate change, and how people can take action to address it.
3. There is no single best way to educate people about climate change. Use a variety of approaches, including lectures, discussions, games, and simulations.
4. Learning about climate change doesn't have to be boring. Make it fun and engaging, and people will be more likely to pay attention and learn.
5. Partnering with community organizations that are working on climate change mitigation and adaptation. This helps to build support for climate education, and it will provide opportunities for people to take action.
6. Using the media to raise awareness of climate change and to promote climate education. This includes newspapers, magazines, television, radio, and social media.
7. Supporting research on climate change education helps to improve the effectiveness of climate education programs.



Shaping the Climate Change Narrative

Media's Impact and it Drives Climate Solutions



In a world where Our Environment, or “Mazingira Yetu,” is under unprecedented threat, the power of media shines through as a beacon of change. It is the storyteller, the messenger, and the catalyst for action in the face of the climate crisis. In every pixel, every word, and every frame, the

media unfolds the harrowing narrative of our changing planet. It reveals the scars etched into the fabric of our existence – from the shrinking ice caps to the raging wildfires, the vanishing species to the displaced communities. In the pages of this issue, we delve deep into how media, like a lens, focuses our attention on the consequences of climate change. It vividly portrays the implications for our people, biodiversity, and the fragile economy we depend on. It echoes the dire warnings that the very life-supporting systems of our planet are in peril.

But media is more than just a mirror reflecting our plight; it's a call to action. It beckons policymakers to listen, to craft sustainable solutions, and to act decisively. It empowers communities, arming them with knowledge and awareness, as they step up to confront the climate change challenge. Here, within these pages, we uncover the inspiring stories of individuals and communities who have taken up the mantle of climate action, striving not only to mitigate the effects but to fortify their very foundations against the tempestuous forces of change. Join us on this journey through the symbiotic relationship between media and the climate crisis. Let's explore how, together, we can harness the power of storytelling, raise our collective voices, and forge a path towards a more resilient, sustainable future for Mazingira Yetu - Our Environment.

Megaphones of Change and Planting Hope: How Media Amplifies Green Warriors

In the symphony of environmental conservation, the media takes on the role of a conductor, spotlighting the unsung heroes who are nurturing the very soul of our landscapes. These environmental champions are not adorned with capes, but with shovels and the unwavering determination to plant trees, one sapling at a time. In the bustling heart of communities, they mobilize people, kindling a collective spirit to breathe life back into the earth. The media has become their megaphone, amplifying their stories of resilience and unwavering commitment. As we read their narratives, we find inspiration, not just in their deeds but in the broader idea they represent: a resounding call for simple yet transformative acts that can fortify our landscapes and ecosystems against the relentless forces of climate change. As Wangari Maathai, the legendary Nobel Peace Prize laureate for her tireless work in environmental conservation, once said, "I will be a hummingbird; I will do the best I can." These environmental heroes



In the resolute face of impending El Niño rains, our nation stands unified, thanks to the unerring guidance of the media.



embody the spirit of the hummingbird, fending off the destructive flames of climate change with their simple yet profound actions. Through the media, their stories light a path for communities far and wide, reminding us that we too can be hummingbirds, igniting the winds of change in our own backyard, and in doing so, protecting our planet's legacy for generations to come.

Sounding the Clarion Call: Media's Role in Disaster Preparedness

As the pendulum of climate change swings, the drumbeat of media's influence grows ever more profound. In the resolute face of impending El Niño rains, our nation stands unified, thanks to the unerring guidance of the media. With their unwavering commitment, meteorologists and scientists have harnessed the power of this formidable tool to forewarn us of nature's fury. Through the airwaves, newspapers, and digital screens, they have sounded the clarion call for preparedness, ensuring our citizens are not caught off guard. The message is clear: El Niño, a harrowing effect of climate change, is once again upon us, bringing with it the specter of heavy rains, flooding, and the relentless battering of our cherished landscapes. But here, in the echo of these media alerts, lies our strength. We, the people, spurred on by the vigilance of the media, rise united and resolute to protect our homes, our communities, and our nation from the impending deluge. The media is not just a messenger; it is our guardian, our beacon of hope in the tempest of climate change.

Shining a Light on Climate Innovation: Media's Power at Play

In a world where the symphony of climate change intensifies, the media continues to act as our conductor, not only revealing the challenges but also orchestrating the notes of hope and innovation. Enter the stage, Direct Air Carbon Capture (DACC) Technology, a groundbreaking innovation that promises to rewrite the climate narrative. Here, on Kenyan soil, we find ourselves blessed, thanks to the watchful eye of the media, with a shining beacon of

hope in Octavia Carbon. It's not just a company; it's a pioneer, leveraging the very bedrock of our nation's geology to capture and permanently store carbon, rewriting the rules of climate action. It's the media that brings this revelation to our attention, enlightening us about the existence of alternatives, such as nature-based interventions, that hold the promise of mitigating climate change. Without the media, we'd remain in the dark about these awe-inspiring advancements in our own backyard, in a world where innovation and environmental stewardship dance hand in hand towards a brighter, more sustainable future.

Balancing Justice and Sustainability: The Power of Investigative Journalism in Holding Projects Accountable While Sustaining Their Future

In the ever-evolving landscape of climate change projects, the role of media is undeniably vital. It's through the lens of investigative journalism that we shine a spotlight on human rights violations and injustices within the realm of climate action. As the guardians of truth and the champions of the voiceless, you play an invaluable role in calling out the wrongs and urging for fairness and justice. You empower us to hold these projects accountable and ensure that the most vulnerable among us are protected. However, as we navigate the delicate intersection of climate action and media, we are reminded of the story of the Northern Kenya Rangelands Trust, the biggest carbon project in the region, which was temporarily suspended. Media's diligence in shedding light on human rights violations within the project was pivotal, leading to necessary introspection and reform. This massive project had garnered an impressive \$14.6 million worth of carbon credits, underscoring its significance in our journey towards sustainability.

Yet, this remarkable case also reminds us of the need for restraint and moderation. It's a call to strike a balance between the power of investigative journalism and the imperative of nurturing these climate action projects. Let us continue to expose injustices and guide these initiatives towards a brighter future without jeopardizing their funding or

continuity. In the challenging landscape of climate change projects, our collective goal is not merely to halt, but to advance, not only to investigate but to inspire, and to ensure that fairness prevails without stifling the very projects that hold the promise of a more sustainable tomorrow. Let us navigate this path with responsibility, mindfulness, and the unwavering commitment to positive change.

Conclusion: Climate Resilience in Focus: Heroes, Preparedness, and Innovation through Media

In the grand symphony of our world, where the crescendo of climate change reaches ever greater heights, the role of media emerges as a guiding conductor, leading us through the complexities and nuances of this critical narrative. As we've journeyed through these pages, we've witnessed the media's ability to reveal and revitalize, to expose the darkest corners of environmental injustices, and to illuminate the most promising paths to a sustainable future. As we reflect on the intricate dance between media and climate change, we must remember that our collective mission is to inspire and guide. We must illuminate the path toward a more sustainable world without extinguishing the flames of innovation, hope, and heroism. Let us continue to wield our power as an instrument for truth, for change, and for a future where the harmony of climate and community coexist in balance. The media, the ever-resonant conductor of this climate symphony, remains the guardian of our planet's song, harmonizing narratives of challenge, hope, and innovation. Together, we can craft a world where each note, each story, and each action strikes a chord of lasting change.

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Muramati Primary School. By: Kevin Maina - Leo Project

The Intersection of Art and Climate Change

A deep dive into the Nexus Dicey Board Game's visionary approach to Climate Education through art.

Have you recently enjoyed a board game? Did it captivate your attention? Did it offer lessons or was it purely for amusement? Notably, several board games, like Chess, Monopoly, and Scrabble, are not just pastimes; they're educational tools that foster mental growth for all ages. Now, imagine a board game that not only entertains but educates about the environment and climate change through the medium of art.

In today's world, we are facing the devastating impacts of climate change. Therefore we need innovative solutions that capture attention and stimulate climate action. At the Laikipian, we have developed an innovative and fun board game.

The "Nexus Dicey," is a transformative board game that seamlessly merges art and climate education into a powerful tool for raising awareness and

inspiring change. This intersection of art and climate change embodies a potent strategy for driving home the urgency of environmental conservation and climate action.

Art possesses a unique ability to transcend language barriers, evoke emotions, and convey complex ideas. Climate change, being one of the most critical challenges of our time, necessitates effective communication that resonates with diverse audiences. The Nexus Dicey Board Game takes this concept to heart, employing engaging visuals, interactive gameplay, and informative narratives to educate players about climate change and its ramifications.

Many individuals in the global south find comprehending what climate change is to be quite complex, given the continuous introduction

of new terms to define unfolding events. Despite being the most affected by climate change and its impacts, people in the global south often find their voices and concerns marginalized. Therefore, how can we communicate the solutions or highlight the solutions people in the global south are already doing? We believe that art has the power to simplify this complexity.

The Evolution of Nexus Dicey

The journey of Nexus Dicey's creation summarises a passionate commitment to effecting positive change. The game's inception was not merely about designing an engaging pastime, but a deliberate endeavor to ignite conversations about climate change. The Laikipian is collaborating with conservation organizations, educators, and environmentalists to spread the board game across various circles that blend entertainment with enlightenment.

Nexus Dicey delves deep into the multifaceted realm of climate change, covering topics from renewable energy to sustainable agriculture and beyond. This comprehensive approach ensures that players gain a well-rounded understanding of the interconnectedness of various environmental challenges. As players navigate through the game, they become equipped with insights that empower them to make informed choices in their daily lives.

Uniting Passion and Purpose

At the heart of Nexus Dicey lies a collective passion for safeguarding our planet's future. The game's artistry serves as a bridge between the emotional connection individuals feel toward nature and the imperative for action. It also builds curiosity among players. It transforms climate change from a distant concept into a tangible reality, fostering a sense of responsibility that propels players to become stewards of the environment.

Nexus Dicey is not merely a source of amusement; it's a catalyst for change. The game's immersive nature prompts players to grapple with the consequences of their decisions, fostering a sense of accountability.



DDI Expo. By: JP Imagine Studio

It also showcases the solutions and actions that can be taken. It is also relatable with players in the global south, especially in the East African region. Through experiential learning, individuals grasp the significance of sustainable practices, resource conservation, and the collective role we play in shaping the planet's destiny.

The Future of Climate Education Through Art

In the journey toward a sustainable future, education stands as the cornerstone. Nexus Dicey represents a transformative approach to climate education, seamlessly merging art, entertainment, and information. As it continues to spark conversations, empower individuals, and incite action, Nexus Dicey shapes a new narrative—one that marries art with advocacy and inspires generations to safeguard our planet.

In an increasingly interconnected world, the intersection of art and climate change serves as a beacon of hope. Nexus Dicey, with its unwavering commitment to education and empowerment, stands as a testament to the power of creativity in effecting meaningful change. As we navigate the challenges of climate change, we hope that Nexus Dicey's journey illuminates the path toward a greener, more sustainable world. By starting conversations on climate change we can foster climate action for generations to come.

Victoria Wangui Wanjohi
The Laikipian, Marketing and Social Media Coordinator



Children playing during the set at People park korogochu.
Source: Tony Wild

THE ROLE OF FILM & DOCUMENTARIES IN RAISING AWARENESS ON CLIMATE CHANGE

In a time when climate change is a grave fact, the power of films and documentaries to shape perceptions, evoke emotions, and inspire societal change cannot be overstated.

Climate change is not merely an environmental crisis; it is also a complex problem with political, economic, and social implications.

Film and documentaries have become effective resources to shed light on this complex situation and help viewers understand its seriousness, importance, and wide-ranging effects.

This article explores the crucial part that films, movies, and documentaries play in bringing attention to the issue of climate change, explaining how they motivate action, promote empathy, and spark a coordinated

response to the environmental emergency.

It will highlight how films establish emotional connections, showcase those affected, serve as educational tools, encourage conversations, inspiring advocacy, influence policy discussions and finally bridge cultural divides

Visual Storytelling: Establishing Emotional Connections

The power of visual storytelling to convey complex information in movies and documentaries is unmatched. With its complex scientific underpinnings, climate change can frequently seem far away and intangible. However, this abstract phenomenon becomes palpable and emotionally impactful when it is portrayed in film storytelling.

Films like "Cowspiracy" and "Seaspiracy" masterfully use the power of visual storytelling to vividly illustrate complex data, statistics, and interviews. As a result, they can craft a compelling and resonant narrative that expertly communicates complex information about environmental issues, particularly the significant effects that animal agriculture and the fishing industry have on the ecosystems and climate of our planet.

These documentaries, visuals, and images provoke emotional reactions and captivate audiences on a deep level with spectacular imagery and expert narrative, helping viewers gain a better understanding of the many difficulties these businesses face and forcing viewers to face the crisis' brutal reality.

Human Stories: Personalizing the Impacts

The climate crisis affects communities, people, and civilizations throughout the world and is not a remote, isolated occurrence. By telling the tales of the individuals who are most directly impacted, these films can humanize this global issue. They fill the gap between data and actual human experiences by highlighting the hardships of those who are experiencing the effects of climate change firsthand.

Documentaries and films like "Kisilu: The Climate Diaries" and "Thank You for the Rain", exemplify the power of immersing viewers into the lives of individuals impacted by climate change within various communities and their daily existence. In both "Kisilu: The Climate Diaries" and "Thank You for the Rain," films we are introduced to Kisilu, a farmer from Kitui County, Kenya and his family, as they courageously face the devastating consequences of climate change. By intimately portraying the struggles, aspirations, and resilience of these people, these documentaries illuminate the profound human

dimension of the climate crisis. Through personal stories and firsthand accounts, these films not only underscore the urgency of addressing climate change but also foster empathy and inspire action among audiences worldwide. They bring viewers into the lives of people affected by displaced populations, environmental deterioration, and harsh weather disasters, encouraging empathy and making viewers understand that the climate crisis is not just an impersonal issue but also a deeply personal one. This intimate connection between viewers and the subjects depicted underscores the need for collective responsibility and immediate action to mitigate the far-reaching impacts of climate change.

Educational Tool: Simplifying Complex Concepts

Film and documentaries serve as educational tools by simplifying intricate scientific concepts for wider comprehension. Despite their importance, scientific reports may not be able to hold the public's attention as effectively as visual narratives. By translating complex climate science into accessible language and relatable metaphors, these mediums empower, enabling them to grasp the causes, consequences, and potential solutions to the crisis.

Documentaries like, "Chasing the Coral" and "A Plastic Ocean" feature and highlight experts and scientists debating the causes and impacts of climate change. These films provide informative explanations, presenting scientific concepts in a captivating and visually engaging style. Both the films simplify intricate scientific concepts related to coral reefs, climate change and have ultimately raised public awareness, inspired action and finally contributed to a broader understanding of these critical issues.

By translating complex climate science into accessible language and relatable metaphors, these mediums empower, enabling them to grasp the causes, consequences, and potential solutions to the crisis.

Fostering Dialogue: Encouraging Conversations

One of the most significant impacts of film and documentaries lies in their ability to spark conversations and start dialogues. These films act as conversation starters, encouraging viewers to discuss and debate the crisis's various aspects. As people share their thoughts and perspectives, a ripple effect is created, leading to increased awareness and a broader discourse. The "Our Planet" series and the film "2040" series have ignited impactful dialogues about sustainable living, wildlife conservation, and effective climate policy. By highlighting and emphasizing innovative and creative solutions and the urgency of addressing environmental challenges, these films empower and encourage individuals to take on an active role as agents of change within their communities. and the pressing need to solve environmental issues. Their thought-provoking narratives and themes not only raise awareness but also encourage viewers to consider and explore practical steps for fostering positive environmental transformation and driving collective action on a global scale.

Inspiring Advocacy: Driving Action and Activating Change

Films and documentaries play a pivotal role in inspiring viewers to transcend mere awareness and take meaningful action. People are propelled to become more than passive observers by the impactful and compelling storylines and verifiable evidence presented through various platforms. Motivated by the pressing challenges and real-world examples presented, people are inspired and driven to engage in proactive activities. These actions cover a wide range, from incorporating sustainable practices into daily living to supporting environmentally friendly goods and technologies, taking part in community-based projects, and even joining grassroots groups that advocate for radical policy shifts. Storytelling and evidence-based information are combined to give audiences

the information and inspiration they need to effect significant change, eventually helping to make our planet's future more sustainable and resilient.

Documentaries like "Rotten" and "A Plastic Ocean" have a strong emotional impact on viewers, inspiring them to take action that goes beyond the scope of the films themselves and improves their knowledge. These two videos, each shedding light on significant topics concerning food production methods and plastic pollution, prompt and compel viewers to reconsider and reevaluate their own decisions and their contributions to resolving these urgent global concerns.

In response to the revelations presented, many people have decided to match their consumption patterns with their ideals in response to the findings made. This has manifested in concrete acts such as encouraging food that has been produced ethically by choosing regional and sustainable options, cutting back on meat intake, and calling for greater openness in the food supply chain.

Similar to this, "A Plastic Ocean" has inspired viewers to actively look for alternatives to single-use plastics, take part in beach clean-ups and plastic waste reduction initiatives, and call for more stringent regulations on plastic production and disposal.

Furthermore, these two films/documentaries have triggered a domino effect by sparking conversations within communities, workplaces, and social circles. These discussions, which were motivated by the lessons learned from the films, have raised awareness and inspired more individuals to take part in community projects meant to effect positive change.

Impact of Policy: Getting in the Decision-Makers' Heads

The influence of film and documentaries extends beyond individual action to the realm of policy and governance. When a documentary resonates with a wide audience, it can create public pressure that compels policymakers to take the climate crisis seriously.

In addition to serving as films, documentaries like "Before the Flood" and "Seaspiracy" have transformed into major political and policy change agents that have sparked debates and initiatives on important environmental concerns.

Led by Leonardo DiCaprio's campaign work, the 2016 film "Before the Flood" boosted discussions on climate change on a global scale. This film not only increased awareness but also helped shape important international agreements like the Paris Agreement, demonstrating how media can have an impact on influencing high-level policy decisions.

In a world wrestling with the implications of a changing climate, films, and documentaries emerge as beacons of hope, raising awareness about the urgent need for action.

In the instance of "Seaspiracy" (2021), the documentary's emphasis on the damaging effects of the fishing industry on the oceans sparked passionate debates on marine conservation, fisheries management, and the pressing need to stop overfishing and environmental damage. The movie has caused people to reevaluate fishing methods, which has resulted in calls for stronger laws and environmentally friendly methods.

These documentaries have demonstrated their power to mobilize communities, influence public opinion, and ignite political discourse. Critical environmental challenges have forced governments and groups to act by placing them at the forefront of the public conversation. As a result, governmental measures have been launched to address the adoption of renewable energy, the management of plastic waste, the mitigation of climate change, and more. In this way, these videos work as potent weapons that inspire group action and bring about significant change on a worldwide level in addition to informing.

7. Global Outreach: Bridging Cultural Divides

Global challenges like climate change require a collective response transcending geographical and cultural boundaries. Film and documentaries act as a universal language that anyone from any background may understand and enjoy. responsibility and solidarity in combating the climate crisis. Documentaries like "Our Planet" (2019) have attracted audiences all across the world, generating a sense of global interconnectedness and mutual concern. It emphasizes the interconnectedness of Earth's ecosystems and the necessity for international cooperation to solve climate change and biodiversity loss.

In a world wrestling with the implications of a changing climate, films, and documentaries emerge as beacons of hope, raising awareness about the urgent need for action. Through visually emotive storytelling, personal narratives, and educational content, these mediums offer audiences a window into the complex world of climate change. Film and documentaries play a crucial role in defining a collective response to the climate problem by building empathy, motivating advocacy, influencing policy choices, and fostering cross-cultural understanding. As global citizens come together to confront this challenge, the power of film and documentaries remains an invaluable tool to address this challenge.

"We can't keep pretending that waste is just a burden to be managed. It's a valuable resource that, when harnessed properly, can create jobs, protect the environment and empower communities. Our mission at Baus Taka is to not just manage waste, but to be a catalyst for change and a shining hope of women and girl empowerment through leveraging on technology." – Dr. Tayba Hatimy, co-founder, Baus Taka Enterprises



The Kokosho women group participating in a training session on drip irrigation installation. source ALIN

The Role of Civil Society in Climate Change Adaptation in Kenya

Modestor Lynn
Youth Coordinator, Kenya Climate Change Working Group

Climate Change has been the unprecedented threat to lives and livelihoods all across nations of the world.

The Global South has been the worst hit by the growing effects of climate related disasters including increased cases of floods, droughts, wildfires among a myriad related effects. This is despite developing worlds being among the least contributors to Greenhouse Gas emissions. Africa's emission contribution stands at less than 4% of global emissions, but she continues to be worst hit by decisions made by developed countries.

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6)-highlights that there is a higher likelihood of the global temperature rising beyond the 1.5°C goal before 2025. Furthermore, some communities and ecosystems have been so badly hit and are fast approaching hard limits to adaptation, with the impacts becoming too frequent and severe for them to avoid loss and damages.

Climate change adaptation and mitigation have been key components in addressing the climate change effects experienced by communities across various countries. Climate Change adaptation looks at ways of changing/altering our systems and way of living to protect ourselves, economies and environment from the impacts of Climate Change; while Climate mitigation looks at measures to reduce GHG Emissions into the atmosphere including on

carbon market systems. Many countries, especially those of the Global South are inclined to climate adaptation, given their minimal emissions and significant climate effects. This is however limited by insufficient funds towards Climate adaptation from the Global North.

As countries grapple with the effects of climate change, a powerful and dynamic force has been at the forefront of catalyzing climate resilience and action. Civil Society Organizations are often also referred to as Non-Governmental Organization, and are private and independent entities that work outside the scope of government influence and profit making. In the Kenyan climate change context, CSOs have been integral in the fight for climate action and climate justice, especially for marginalized and indigenous groups.



Participants at climate change adaptation workshop.



Modestor Lynn facilitating a climate change adaptation workshop.

Roles of Civil Society Organizations

Understanding the Kenyan Climate Landscape.

Climate change adaptation is based on intersectionality, understanding the various effects

of climate change on people, environment and the economy. These scenarios are different in the different Kenyan counties. CSOs are often created and work within various communities, thus developing close ties with the communities, sharing in their climate impact stories and understanding their unique adaptation needs. This helps in developing information of community climate impacts, priorities and advises components of advocacy, project solutions, financing and policy.

Driving Community Centered Solutions

One of the challenges of global solutions are their mismatch to the local needs of the various communities. Climate adaptation requires adaptability, focusing on the changing climate conditions, effects and needs within the various communities. CSOs play an important role in collaboratively working with communities to develop climate adaptation solution projects that touch on the community climate needs and priorities.

The Financing Locally-Led Climate Actions (FLOCCA) programme is one key way aimed at developing locally-led climate resilience actions. CSOs have been part of building the county and community capacity through Ward Climate Change Committees for planning, budgeting, implementation, reporting and implementation for local climate actions.

Advocacy for Climate Policy Change

The climate change policy space is integral in developing climate adaptation in Kenya. Policies provide legal and binding strategies, plans and commitments to adaptation. CSOs play a key role in ensuring Kenya's policy strategies, plans and Bills prioritizes marginalized community climate adaption needs. These policies result in development of adaptation budgets and projects based on the country's policies. Furthermore, CSOs provide research, data and perspectives gathered from the frontlines of climate impacts, thus ensuring policies are grounded in science.

Similarly, CSOs are an integral component in calling world leaders to develop a Loss and Damage Funding Mechanism during the Conference of Parties (COP) 27. This was rooted on many communities, including Kenyan communities, experiencing climate effects that are beyond adaptation.

Building Public Awareness

In the development of solutions, policies and diverse financing mechanism, it is easy to miss out on key processes and information. CSOs play the role of ears and eyes of communities, especially in processes not as accessible to grass-root communities. This translates in capacity building campaigns, workshops and community engagement fora. Such public awareness forums empower communities with the knowledge, and aid in development of actions to ensure community inclusion. This aids in fostering community engagements and ownership of such processes that affects them.

Fostering Collaboration and Innovation

The drive for climate adaptation and resilience is based on platforms for knowledge sharing, innovations and resource mobilization. CSOs works propel community collaborations towards adaptation actions. The collaborations also extends to government agencies, academia, and other CSOs enhancing the effectiveness of climate adaptation strategies, resulting in comprehensive and lasting solutions.

The role of CSOs is key in ensuring that community needs is at the forefront of climate change adaptation. However, financing, still remains a big challenge in the effectiveness of CSOs local interventions, as well as sustainability of adaptation actions within



Training of Ward Climate Change Committee.jpg-source SEAF-K

communities. Financing systems need to be reliable and just as adaptable to climate needs and actions to ensure accessibility and impact for community adaptation to Climate Change

There is a long way to go, however, with the climate catastrophe in our midst, putting community at the forefront, authenticity, and adequate resources will enable climate adaptation progress. Civil Society Organization continue to champion this in the goal to build Climate Adaptation & Resilience and ultimately, climate mitigation-below 1.5°C.

Mainstreaming Gender In Climate Change Adaptation And Mitigation

Imagine having an unwelcome guest in your home. They come in, settle, and make themselves comfortable in your living space. Their presence becomes an intrusive rhythm in your daily life, impacting everything you do. It's like a dark cloud hovering, continuously reminding you of the space they occupy. They disrupt your peace and demand your attention at the most inconvenient times. Despite your persistent attempts to regain normalcy, the unwelcomed guest continues to affect the dynamics of your home, leaving you longing for the day they'll finally pack up and leave.

The unwelcome guest is climate change - a reality that has comfortably nestled itself into our lives. Although governments and unscrupulous corporations laid out the red carpet for its arrival through years of environmental neglect, it is now an intrusive part of our daily stories, affecting our

lives in many unexpected ways. Among the plethora of narratives that climate change comes with, there's one that hums softly yet significantly stands out: the gender narrative. The idea of mainstreaming gender in climate change adaptation and mitigation offers an opportunity for redefining resilience, especially in



Farmer cultivating her crops.

the agricultural sector, where women play a crucial but often overlooked role. Hence, the importance of gender mainstreaming in climate change adaptation and mitigation cannot be overstated.

"Women are the real architects of society," said late American author Harriet Beecher Stowe, capturing the essence of women's contributions to our society and environment. The linkage between gender, climate adaptation, and mitigation is not a new concept; however, it is still not fully explored and integrated into climate strategies.

The term Gender mainstreaming in climate change adaptation and mitigation may sound bureaucratic, but it's pretty simple. It simply means acknowledging that women are not passive victims of climate change but active agents of change. The UNDP 2019 policy brief on linkages between gender and climate change highlights that although women comprise the majority of the world's poor and are, in many instances, more dependent on natural resources, they are also the unseen pillars safeguarding communities against climate adversities.

But how well do we recognize this, and why does it matter? Pause for a moment and imagine the unsung heroes, the small-scale women farmers. A typical day of a small-scale woman farmer unfolds with her toiling under the sun and rain to produce fresh and nutritious food for us all. Now imagine a looming crisis – climate change, threatening not only to wither away the crops but also the hopes and livelihoods of millions of women farmers like her.

Additionally, our modest woman farmer not only grapples with unpredictable weather patterns but societal biases, too. What then forms the bridge between these two scenarios? It's the crucial integration of gender mainstreaming in climate change adaptation and mitigation.

The scenario is a harsh reality for many small-scale women farmers. Their toils often go unnoticed by gender-blind climate policies. Yet, they are a vital component of our resilience to climate change.

These resilient women not only produce our food but also embody the spirit of adaptation and mitigation. So, how can we genuinely expect to address the impacts of climate change without empowering the very people who are directly and most affected by it? If we are to address climate change successfully, we

not only need to adapt and mitigate but also foster inclusivity. This includes recognizing and valuing the contributions of the unsung heroes of agriculture—the small-scale women farmers.

While visiting my childhood home, I found myself irresistibly drawn toward the simple yet profound world of women who worked alongside my mother on our family's modest farm. These women, with their rough hands, gentle hearts, and a wealth of wisdom, represented a narrative often overshadowed in the broader climate dialogue. Their stories are more than just personal narratives but reflections of a broader, global narrative of gender, agriculture, and climate change. They spoke about their daily struggles and their inadequate access to essential resources like seeds, credit, and technology compared to their male counterparts. Their decisions were often overlooked despite their profound knowledge, and they were excluded from participating in decision-making forums by societal norms.

Yet what struck me was not their despair but their resilience. They were the unseen warriors mitigating climate change impacts one season at a time. Their untold stories were a testament to the intertwined relationship between gender equality, climate adaptation, and mitigation. Their life experiences narrate tales of courage, adaptation, and a genuine call to blend policy with reality, statistics with real stories, and discussions with actions. Gender issues cannot be sidelined in climate discourse.

The dialogue on climate action will remain hollow until we embrace the perspective of women farmers, acknowledge their challenges, and amplify their solutions. Their marginalization is not just a gender issue but a significant gap in our climate resilience strategies. Every one of us has a stake in this. Let's advocate for policies and initiatives aimed at empowering women in agriculture and encouraging gender-sensitive climate action. Each policy revision and resource redirected towards empowering women in agriculture moves us closer to a resilient and equitable future.

Elizabeth Atieno Opolo, Food Campaigner, GREEN PEACE



2CYNESA Rwanda's project on PET organic gardens at the household level

Tapping into the Power of Young People for Climate Action

Young people, and particularly young people of faith in Africa, have inimitable power to address not only the climate crisis that threatens their present and future but also the conjoined challenges of biodiversity loss and plastic pollution. From innovativeness to being the majority of the population of the world and the opportunity to change the course of harm on the planet by altering the political, social, and economic trajectory of the harm on the environment through the existing models of finance and policymaking. In this article, I highlight some of the ways through which the Catholic Youth Network for Environmental Sustainability in Africa (CYNESA) taps into the power of young people for climate

action with a focus on individual action and collective call for action within CYNESA's scope of work in formation and awareness creation, networking and advocacy, and support for local grassroots action.

For example, I know of one Pius Muthaa who, after attending a workshop hosted by CYNESA, could not wait to get started the following morning. He woke up the following morning and started collecting seeds around his family home and began growing fruit and indigenous trees. He would fetch water from the stream that passes downhill by his parents' land. This was in 2021 right after the COVID-19 pandemic.

Upon attaining transplanting age, he started distributing the seedlings to his community members free of charge during the rainy seasons. Years later, Pius, at the invitation of CYNESA, would address about 150 participants of the CYNESA Laudato Si' Youth Assembly and explain to them how he had employed

himself by growing fruit trees and bamboo for sale. His mixed social/charity enterprise business model continues to gain traction and he can hardly satiate the demand for bamboo, especially. With CYNESA's support, he mobilized his community to meet with the CYNESA team to learn about growing organic food including in plastic bottles at his parents' homestead in Kaguthi, Murang'a County, Kenya, just as CYNESA had done with women in Rwanda and Cameroon.

Such acts demonstrate the value of action-driven advocacy, which has a more sustainable and perpetual impact than any other form. It is simple, young people must start by acting where they are, using what they have, and doing what they can, with whoever (of goodwill) they can. Their communities, institutions, and places of worship offer fertile ground.

In reality, young people also have unmatched energies to dedicate to climate action advocacy more than any other age group. With the strength that they possess, coupled with their numbers, young people have more power to advocate for climate action both in word and deed than their older counterparts. For instance, if young people around the world united in a single voice to initiate climate action and encultured the growing of indigenous and fruit trees in their communities to address the climate change crisis, they would create a ripple influence today and cause a change from the destructive to the constructive, pro-planet and pro-people culture.

Today, young people enjoy massive access to progressive and disruptive technology that has eased communication and access to knowledge more than ever before. There is vast access to mass media (radio and television) in relatively short periods of time and with greater variety and reach than was the case about three decades ago. Young people can easily mobilize over the Internet without the need for as many resources as would be required for an in-person gathering.

For example, a tweetstorm or a Facebook/Youtube/Insta/TikTok live can be instrumental in showcasing innovation and action to entice more young people

to emulate action-driven advocacy. Acknowledging that tech tools and innovations can be exclusive to only those with access and tech literacy, young people continually demonstrate a strong and steady inclination towards learning and rolling out innovative tech solutions. It does not have to be complex or smartphone-based. Tech innovation can be as locally-disruptive as the story of 13-year-old Malawian, William Kamkwamba whose story inspired the movie, "The Boy Who Harnessed the Wind."



Pius Muthaa on his parents' farm in Murang'a, Kenya posing with the bamboo he grew before selling it.

Talk can be cheap, but it doesn't have to be. Increasingly, from where I sit, the noise in the virtual and physical streets may register some wins, but it is getting into the system and getting those in the system to change their perspectives through lobbying that tends to influence more. I have found that the push by young people through talk and protests, etc. has its gains, but it can only come somewhat far. When young people run for political office, engage intentionally in climate policy discourse, draft policy papers, and hold open and objective discussions with older, seasoned policymakers in intergenerational dialogue and intergenerational knowledge transfer approach, they stand to gain and influence more, bigger wins than when they hold out placards in the streets and call out policymakers in the corner office high up on the fourteenth floor. By no means am I suggesting that young people stop the protests; all I am suggesting is that it should not be the only thing that they do.



3A section of the young people on a march of faith and action during the CYNESA Laudato Si' Youth Assembly in July in Arusha, Tanzania

When young people get the opportunity to lead, they must then lead by example in their communities and institutions. In 2015, I learnt about the detrimental effects of plastics and how plastic-bottled water robs the poor of any hope to access clean and safe water by commercializing water access in a greedy, capitalist manner. I became more alive to how, driven by the throwaway culture, plastic pollution continues to harm the life on land and life under water through pollution and, as in Laudato Si' paragraph 21, causing "The earth, our home, [to begin] to look more and more like an immense pile of filth." I vowed to never take plastic-bottled water and encourage others to follow suit.

When I got elected democratically as one of the



David facilitating discussion at the plastic-bottled-water-free 2023 RCM Africa in August at Capital Hotel, Addis Ababa

two Regional Facilitators of the UN Environment Programme (UNEP) Major Groups & Stakeholders, Africa (basically all the nonstate organizations with accreditation to the UNEP in Africa), I was convinced that I could influence positive change by

championing for the environment in a practical and easy-to-imitate manner. Besides talking about it, I began influencing change of mindset towards plastics and plastic-bottled water. For example, together with my co-facilitator, we are responsible for organizing the Regional Consultative Meeting (RCM), which is the meeting of all MGS, Africa and other nonstate actors that is normally held right before all the African ministers

of the environment meet for the African Ministerial Conference on the Environment (AMCEN). When I arrived at the venue of the 2023 RCM, Africa in Addis Ababa, I immediately noticed the eyesore that is plastic-bottled water on every table. I indicated firmly and politely to the hotel management that we could not hold a meeting with plastic-bottled water "littering" our conversation. After deliberations, the hotel offered us a common watering point and withdrew plastic-bottled water from our tables.

With the world grappling with the triple planetary crisis of climate change, biodiversity loss, and pollution, young people should reflect on their impact (both positive and negative) before calling out others. Refusing the throwaway culture, promoting sustainable consumption and production, choosing simple lives, taking simple actions like choosing products with tin packaging over plastic packaging, switching off lights, turning off taps, growing organic food, engaging meaningfully in policymaking forums, taking leadership and positions of influence, building intergenerational bridges, establishing and/or volunteering in organizations/businesses/institutions that will influence change and outlive the young people, and educating the younger ones are some of the examples of how the planet can tap into the power of young people for climate action. The is power in **YOUTH!**

David Ngigi Munene, Young Africa Leadership Initiative Fellow (YALI) and Programs Manager at Catholic Youth Network for Environmental Sustainability in Africa (CYNESA)

YOUTH & CLIMATE ACTION

Urban River Restoration Training in Githurai river in Githurai

Research conducted by the United Nations reveals that there are 1.8 billion people in the world aged between 15 and 35 years. This is the highest population of youth ever recorded, and yet, there are very few solutions that have been successfully implemented to ensure that these youth inherit a beautiful and stable environment. Climate change and environmental degradation are some of the seemingly irreversible consequences of our industrial world. Unfortunately, the youth and future generations are left to bear with these repercussions.

The youth are a valuable resource and hold great potential to make this world a better place. Young people are malleable, more receptive to new ideas and have high adaptability to changes. Additionally, different studies have concluded that this is the most educated generation in history, with high mobile phone penetration and computer literacy enabling youth to access and share information. These factors prove that young people are an important asset in driving climatic mitigation and adaptation strategies. Moreover, the effects of climate change are felt strongly by the youth. Having to right the wrongs of a different generation is a heavy burden to bear, especially when the systems that worsen climate change are still in place. The high rates of unemployment, especially in developing countries, have made the youth more susceptible to the negative effects of

climate change. Young people from marginalized communities and low-income households have become victims of food insecurity, water shortage and health hazards linked to climate change. We all need to collaborate to restore the planet, however, most of the responsibility to protect the environment falls on the young generation. Numerous efforts need to be made towards educating the youth and giving them the necessary tools and platforms to effectively advocate for and implement adaptation and mitigation measures.

Empowerment through Education

Despite widespread knowledge of the occurrence of climate change, many youths have not yet made a conscious decision to be part of the solution. In fact, majority are not aware of international summits and conferences held to discuss climate change and that their respective country might have made a pact to reduce green house gas emission. They are either uninterested in the topic, or do not know where to actively seek climate-related information. It is important to establish youth programs aimed at mobilizing the youth and creation of awareness. Climate change education programs set up by both governmental and non-governmental organizations prove to be effective in engaging the youth and sparking their interest in all matters related to climate change.

Educational institutions should be more intentional about instilling environmentally friendly habits to their students. Habits such as proper disposal of waste, recycling and re-using may seem small but play a very crucial role in reducing pollution. The youth are the future, hence, helping them adopt better habits will eventually produce environmentally conscious citizens capable of positive action. Furthermore, youth need to know where they can access intellectual and financial help to support innovative adaptation or mitigation measures. Institutions of higher learning are now incorporating sustainable development topics in their curriculum, a move that will ensure that graduates will fit in sustainable industries and be willing to take advantage of environment-oriented employment opportunities. It is the role of the government and other stakeholders to take youth empowerment seriously and ensure that creation of awareness on climate change happens through formal and informal systems. Educating the youth has a ripple effect; whereby informed youth will engage other youth, creating a generation of radical people willing to change for the better.

Green Skills

Climate adaptation measures are important in helping us adapt to climate change, but they are not enough. 'Green skills' are the long-term solutions we need to create a paradigm shift on our behaviors and attitudes towards the environment. Cultivation of green skills among the youth involves tapping into one's intellectual capabilities; developing practical and technical skills and; promoting responsible consumerism to drive sustainable development goals. Intellectual capabilities are vital in designing workable adaptation and mitigation measures. Youth with high intellect can design innovative technology applicable in climate-sensitive sectors such as the transportation industry, the energy industry and agriculture. Additionally, intellectualism goes hand in hand with eloquence, and such youth can participate in activism and get included in decision making processes.

Secondly, equipping the youth with practical/ hard skills will help put their energy into good use. Climate

change action such as re-afforestation, building of gabions and terraces, cleaning up rivers and wetlands etc. require manual labor that can be supplied by the young generation. Manufacturing green products and substances requires knowledge and skills in engineering and research in environmental sciences, hence the need to be dexterous. The youth are also creating job opportunities through recycling and repurposing glass and plastic waste. This is a difficult job that requires manually picking and sorting through piles of garbage and finding willing buyers of the end product. 'Hard skills' are important in getting the work done. Every young person needs to understand the importance of practical skills to participate in adaptation and mitigation measures better. The youth need to be ready to get their hands dirty in this journey of reversing environmental degradation.

The youth can form the generation that refuses to consume non- renewable energy, products that are non-biodegradable and agricultural products produced through unsustainable practices. They can make it the norm to purchase from companies that have a way of recycling or repurposing their waste products. These environmentally friendly habits are transferrable to the next generation and will help us attain our sustainable development goals.

The importance of engaging the youth in climate action cannot be overemphasized. The youth are a valuable asset in the mitigation of climate change, yet, they are also very susceptible to climatic impact. If the right course of action is not taken, we risk losing an entire generation (the future of the human race) to the detrimental effects of global warming. The ability of the young generation to adapt to changing industrial needs and make better consumer choices has proven that sustainability is possible. Giving the youth the right platform to voice their demands and resources to implement mitigation measures will ultimately save the planet.

Dina Kisa, Science writer

INCORPORATING CLIMATE EDUCATION IN SCHOOL CURRICULUM



Students from Remba Primary School
Source: Tony Wild

"Education systems do not currently address the gravity of the climate crisis." UNESCO.

In a survey done ahead of the joint meeting of environmental and education ministers at COP26 Glasgow in 2021, it was established that only 53% of the world's national education curricula make any reference to climate change.

It is further alarming that less than 40% of the teachers surveyed wouldn't comfortably teach on the impact of climate change. Luckily, Kenya falls among the countries with aspects of Climate Change embedded within its curriculum at various levels. The jury is still out on whether the content as it is, is sufficient to translate into the desired behavioral change.

UNESCO (2009) further notes that climate change education should focus on transforming learners into critical thinkers, life-long learners and adoptable. Goal (viii) of the national goals of education is “to promote positive attitudes towards good health and environmental protection.” The essence of attitude in any form of education cannot be overemphasized.



Students from Remba Primary School.
Source: Tony Wild

Attitude is what makes the difference between talk and action. Parties to the Paris agreement, affirm the importance of education training, public awareness, public participation, public access to information.

Findings of various studies, affirm that the knowledge on climate change and the global responses, remains scanty across various levels of education. In a study conducted by Prof. Julius Huho, it was established that “close to three quarters of Kenyan University students are unaware of global responses to climate change, though all of the students studied admitted to having experienced climate change fuelled phenomena such as increased temperatures and erratic rainfall patterns.” In the 8:4:4 curriculum, Aridity, Desertification and Climate Change, are areas that had been covered in the secondary schools’ Geography syllabus.

The syllabus defines climate change, gives causes of climate change; dwelling a lot on the human causes, and the consequences of climate change. However, the topic comes towards the end of the form two course. By such a time, many students would

already have opted out of the subject or made up their mind to drop it. Climate change is mentioned in other subjects; albeit inadequately. Contrary to what one would expect, practical steps on mitigating on the negative effects of climate change is an area the curriculum is passive on; illuminating the gap in the largely academic and exam based system.

The sessional paper 1 of 2019, on “Reforming education and training in Kenya for sustainable development.” recommended the adoption of a competency based curriculum to achieve the development of requisite knowledge, skills, values and attitudes that will help drive the country’s future generations. While the 8:4:4 system was geared towards self reliance, the Competence Based Curriculum is intended to lay greater emphasis on the practical aspects of learning areas. The focus is on the set of specific competence (knowledge, skills, values, attitudes) associated with successful academic performance. It is a knowledge application-oriented type of education.

The CBC approach is an integrated and holistic understanding of what we want the young people to learn, be able to do and to become (KICD, 2017). Due to the centrality of the environment in human activities, CBC proposed the introduction of Environmental Activities to be taught between grades 1 and 3. This is perhaps in appreciation of the strong link between a child’s development at the early age and their attitudes later in life. Recently, Kenya’s president, Dr. William Ruto, received a report from The Presidential Working Party on Education Reforms (PWPER) which among other things recommended the institutionalization of environment conservation and climate change action in all learning institutions. Though this wont be the first time such a recommendation is being made, one would hope that having witnessed the perils of climate change in the form of droughts and floods in the recent past, climate change education would be given the emphasis it deserves.

Addressing a high level symposium at the launch of Cohort III on Climate Justice held in July 2023, the Kenyan Cabinet Secretary for Education, Mr.



Students from Kifaru Primary School Source: Tony Wild

Ezekiel Machogu affirmed that Kenya had taken measures to align the education system with the Berlin 2021 Declaration on Education for Sustainable development to include the environmental education component by 2025. Between now and then, the Ministry of Education, through the Kenya Institute of Curriculum Development, will have to steer the development of teaching and learning resources that integrate climate change topics in various subjects. An enthusiast would even hope that climate Change Education would be made a compulsory examinable common unit in tertiary institutions.

Globally, however, Kenya has a lot to learn from Argentina. Aspects of environmental education are firmly embedded in Article 41 of the Argentinian Constitution.” The authorities will provide for the protection of the right (healthy environment), the rational use of natural resources, the preservation of natural and cultural heritage and biological diversity and environmental information and education.” The National Law for Comprehensive Education) a law proposed in 2021 requires comprehensive environmental education to be taught in every school and to all levels. With such clarity in the law, Climate Change Education stands a great chance of being incorporated into the mainstream education system. This would ensure priority in terms of funding, teacher training and awareness activities. With that, Argentina stands ahead of most countries.

Away from policy and curriculum design, upon which Kenya has done quite well compared to other developing countries, greater focus on matters climate change must be on changes in attitudes and behavior if the threat is to be reversed. Although the formal education system remains the most structured and efficient mode through which climate change awareness can be made, citizens who fall outside this realm must also be brought on board.

Climate change education must be taken outside the four walls of the classroom down to the villages among the peasants. It should be preached on pulpits. It should be voiced in public meetings. It should form an integral component in political campaign manifestos. It should form the basis for physical planning going forward. The media must step up on awareness efforts, and corporates called upon to champion the course of climate change awareness. Just as the world adopted concerted efforts in stemming the effects of the COVID-19 pandemic, Climate Change needs to be handled with such efficiency; it is a do or die affair.

Gideon Obongo
Geography and Business education teacher, St Francis
Rangala Girls High School

The Impact of Water Rising in Lake Baringo, Kenya



School-going children using a make shift boat to access school in Lake Baringo, Kenya
BY Antony Ochieng / Tony Wild

Lake Victoria, Turkwel Gorge Dam and all the Rift Valley lakes have registered significant biodiversity and socio-economic impacts on the vegetation, wildlife and communities living in these areas. There has been destruction of livelihoods and amenities including basic

infrastructure like roads, schools, health centres, hospitality facilities, and fish handling facilities at fish landing sites. The destruction of many hospitality facilities and tourist attraction areas

has crippled the tourism economy. The rising water levels have generally affected an estimated 75,987 households, with a total of 379,935 people at risk. Over the years, the rising water levels in Lake Baringo have claimed 139.98 km² of riparian land. Further, approximately 3,087 households of

communities living around the lake have also been immensely affected. In Lake Baringo the rising water has separated the Kokwa island into three. The rise of the water is said to be the effect of the climate change

A school in the island has been separated from the larger community forcing school-going children to use make shift boats to access school.

One of the short term measures to be taken is to rehabilitate, relocate, and restore damaged infrastructure such as water supplies, sewerage plants, fish handling facilities, health centres, electricity supplies, roads, schools, police stations and police posts as per the specified requirements. (Source: Scoping report on Rising Water Levels in Kenya's Rift Valley Lakes, Turkwel Gorge Dam and Lake Victoria)



Empowering Young Climate Champions:

A Look At "Champions Of The Earth"

Dorcas Kikwai, Founder Ikosafi Africa

Our Earth is sinking under the weight of climate change. A hotter planet, prolonged droughts, intense storms, vanishing biodiversity – these aren't just headlines; they're hard-hitting realities. Human-induced climate change is spinning out of control, and it is the younger generation that must handle the aftermath of our actions. But are they equipped with the necessary knowledge and insight to handle this mammoth task?

Enter "Champions of the Earth: An Epic Adventure in Climate Discovery and Action," an engaging new book that seeks to empower young climate champions with the tools to understand, combat, and most importantly, reverse the impact of climate change. This captivating children's book, a recent publication of Ikosafi Africa embarks on a journey to demystify climate change and empower young readers to become champions for our planet.

"Champions of the Earth" doesn't just narrate the doom and gloom often associated with climate change. Instead, it educates young readers about the causes and consequences of climate change, in digestible, relatable terms.

The book decodes science jargon into everyday language, explains the impact of human actions on the earth and reveals the reality of how climate change affects our daily lives.

"Champions of the Earth" goes beyond merely educating children about climate change; it takes them on an epic African adventure, immersing them in the diverse realities of the continent's climate challenges and showcasing the innovative solutions being implemented across different countries.

The book's narrative seamlessly blends storytelling with real-world examples, transporting young readers to various African nations. They witness firsthand the impact of climate change on communities, from the dramatic shrinkage of Lake Chad in West Africa to

the rising sea levels threatening coastal regions in Senegal.

However, the book doesn't dwell solely on the challenges; it highlights the resilience and ingenuity of African communities in addressing climate change. Readers discover inspiring stories of different African countries embracing renewable energy sources, from wind energy in Morocco, to geothermal energy in Kenya, and hydropower in Zambia.

By showcasing these real-world examples, "Champions of the Earth" instills a sense of hope and possibility. Children realize that climate action is not just a distant concept but a tangible reality, with communities across Africa actively working towards a more sustainable future.

Equipped with knowledge and inspired by young climate warriors, young readers will find themselves eager to make a change. "Champions of the Earth" does not leave them hanging. It presents a clear call-to-action, encouraging children to cultivate sustainable habits and get involved in local environmental initiatives.

Our planet is in crisis. It's going to take an army of enlightened, motivated individuals to fight the climate change battle. As parents, educators, and caring adults, it's crucial we equip our children with the tools they need. "Champions of the Earth" is one such tool, bringing together knowledge, inspiration, and action in a package that appeals to young minds. The book is a stepping stone for the next generation of climate champions, encouraging them to take a stand and catalyze change.

Are we ready to hand over the torch to our young climate champions? Empower the young minds around you with the enlightening read, "Champions of the Earth". Because we don't just need climate-conscious citizens, we need climate champions. And the time to act is now.



1. What do we mean by the term Climate change?

Climate Change typically is a change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels.

Some of the weather pattern may encompass:

- Changes in amount of precipitation received.
- Changes in temperature levels.
- Changes in sunshine intensity.

2. Have you experienced changing weather patterns and climate changes?

Yes, for instance at the dawn of the year, climate change has caused prolonged droughts, severe temperature levels and unpredictable rainfall, causing sub-optimal destruction of crops in the fields and this has adversely affected the quality and yields produced from our farms. The same has also been accompanied by huge amounts of precipitation in form of rainfall and hails which have also lay waste to our crops in the field for example the coffee fields in Kisii county.



3. How is climate change affecting your education?

Climate change as a menace of global order has also affected our education and learning many unprecedented ways;

- The long-term effects of climate change such as marine heat waves produced from the nearby Lake Victoria within our vicinity has affected learning in the classrooms negatively such that during the afternoon hours; the temperature levels are way past optimum hindering the focus of the students mind in the classroom work being relayed.
- Due to the increased levels of precipitation received, the heavy downpour result to floods within the school; this affects our navigation within the school for the classes and also loss of power from the mains.
- The heavy downpour destroys the crops in the school farms which leads to a huge loss which mandates the school to spend a large capital in purchase of meals provided in the school.

4. How can we cope with negative impacts of climate change?

Around the world, millions of us are taking steps to defend our climate. Tens of thousands of school strikers and people from all walks of life have taken to the streets demanding a solution to the climate emergency. For instance Greenpeace has campaigned throughout the globe to enable mankind's activities on the earth's surface to be in



NDIRA PRIMARY SCHOOL

harmony with nature. The society at large can play a vital role in coping up with climate change in the region by:

- Spreading the word and encourage others to reduce their carbon pollution; encourage your friends, family and co-workers to reduce their carbon pollution. Join a global movement like Count Us In, which aims to inspire 1 billion people to take practical steps and challenge their leaders to act more boldly on climate.
 - Lobby local politicians and businesses to support efforts to cut emissions and reduce carbon pollution; Pick an environmental issue you care about, decide on a specific request for change and then try to arrange a meeting with your local representative.
 - Transforming the mode of transport; Transport accounts for around a quarter of all greenhouse gas emissions and across the world, many governments are implementing policies to decarbonize travel. You can get a head start: leave your car at home and walk or cycle whenever possible. If the distances are too great, choose public transport, preferably electric options.
- As potential advice on how to cope up with the negative impacts of climate change; global citizens can adopt to:
- Meteorologists studying the new weather patterns and inform the citizens of impromptu downpours and adverse weather conditions.

1. *What do you understand by the term climate change?*

Climate change is the significant variation of weather conditions over a long period of time i.e. 30-35 years. It can either be warmer, wetter or drier.

2. *How is climate change affecting your education?*

- Climate change causes school dropout due to increased flooding, drought, scarcity in water and lack of food.
- It has also led to loss of school infrastructure and also road making students to withdraw from school or living pupils with nowhere to learn.
- Advanced weather conditions affect teachers incentive to work in areas known to be floody or drought prone living children with no one to teach them.

3. *How can we cope with the negative impacts of climate change?*

- Taking environmentally responsible actions i.e. planting trees.
- Adopting a problem solving attitude i.e. planting trees
- Changing the way we manage our land i.e. using composed manure, rotational cropping and agroforestry.
- Implementing sustainable agricultural practices i.e. planting drought resistant crops, implementing irrigation in a way that we do not depend on rains so much.



SAMBURU GIRLS FOUNDATION



**BARAKA
LEKATAP**
AGE: 12 YEARS
GRADE: 2

1. What do you understand by the term climate change?

This is changing of atmospheric weather conditions over long period of time.

2. Have you experienced changing weather patterns and climate change?

Yes. For instance, some years back, the rain pattern in Samburu was predictable with periodic rains which have now disappeared and the County is dry and hot lately.

3. How is climate change affecting your education?

Lack of rains has caused lack of water hence I waste much of my class time looking for water to cook and bath.

4. How can we cope up with negative impacts of climate change.

Planting trees to attract rains.

Practicing agriculture to fight hunger caused by prolonged droughts

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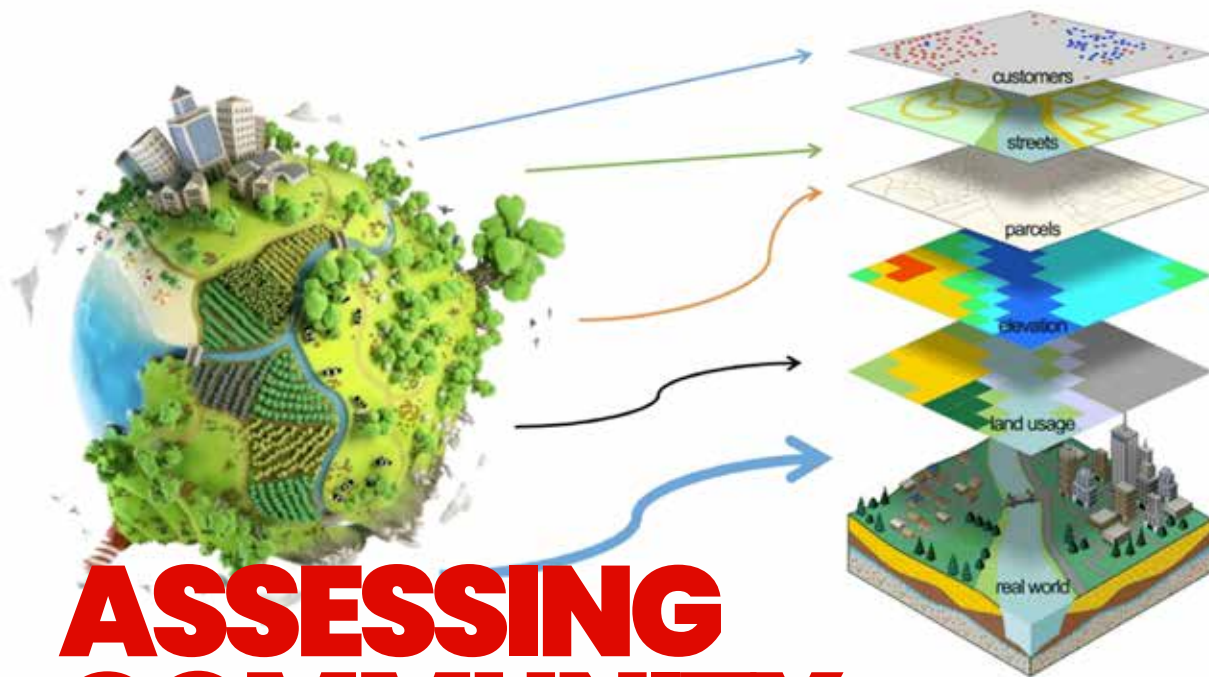
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ASSESSING COMMUNITY VULNERABILITY TO CLIMATE CHANGE

Relationships and Insights from GIS and Remote Sensing Techniques

Climate change has emerged as a defining challenge of our time, with its impacts being felt across the globe. Communities that depend directly on ecosystems for their livelihoods are particularly vulnerable to the changing climate. To better understand and address these vulnerabilities, the use of Geographic Information System (GIS) and remote sensing techniques has proven to be invaluable. This article aims to explore the assessment of community vulnerability to climate change through the lens of GIS and remote sensing.

UNDERSTANDING COMMUNITY VULNERABILITY

The vulnerability of communities to climate change is a complex concept involving three interconnected factors: exposure, sensitivity, and adaptive capacity. Exposure refers to a community's risk of facing climate-related hazards and their impacts, which

can include sudden events like hurricanes or gradual changes such as rising sea levels. Sensitivity encompasses a community's susceptibility to these hazards, considering physical vulnerabilities (like infrastructure), socioeconomic factors (such as poverty), and social dynamics (including cultural norms). Adaptive capacity highlights a community's ability to adapt to climate challenges, drawing from resources like education, natural assets, social cohesion, and technology. Understanding the interaction of these factors is crucial for a comprehensive understanding of community vulnerability and enables effective interventions to enhance resilience in the face of a changing climate.

THE ROLE OF GIS IN ASSESSING VULNERABILITY

Geographic Information Systems (GIS) are essential tools for evaluating community vulnerability to climate change. They enable the integration of diverse data

layers like climate models, topography, land cover, and socio-economic indicators, yielding a comprehensive view of vulnerability across various scales. GIS facilitates the identification

The vulnerability of communities to climate change is a complex concept involving three interconnected factors: exposure, sensitivity, and adaptive capacity.

of high-exposure areas to climate hazards and sensitive populations, aiding targeted adaptation efforts. Through visualization techniques, GIS highlights vulnerability hotspots, allowing decision-makers to allocate resources efficiently and prioritize interventions. By analyzing spatial factors including vulnerability and adaptive capacity, GIS helps identify areas requiring immediate support, empowering policymakers to implement effective strategies for enhancing community resilience in the face of climate change.

REMOTE SENSING FOR ASSESSING CLIMATE CHANGE IMPACTS

Remote sensing, which involves the use of satellite imagery and aerial photographs, complements GIS by providing valuable information on climate change impacts. It enables the monitoring of changes in land cover, vegetation health, water resources, and other environmental variables over time. Remote sensing data can help identify changes in ecosystems, such as deforestation, desertification, or shifts in vegetation patterns, which in turn affect community vulnerability. By analyzing these changes, policymakers and researchers can gain insights into the evolving risks faced by communities.

Furthermore, monitoring environmental changes through remote sensing involves utilizing satellite imagery and aerial photographs to track shifts in land cover, vegetation health, water resources, and other environmental factors over time. This data offers a powerful tool for analyzing the impacts of climate change, revealing alterations in ecosystems like deforestation or urban expansion that directly influence community vulnerability. By

identifying changes in vegetation patterns and quantifying climate-related risks, remote sensing contributes to understanding climate impacts on natural resources and vulnerable populations. Integration with Geographic Information Systems (GIS) further enhances this analysis, enabling a comprehensive assessment of the interactions between environmental changes and community vulnerability. In essence, remote sensing, in conjunction with GIS, enhances the comprehension of climate change effects and supports the development of targeted adaptation strategies.

CASE STUDIES AND BEST PRACTICES

Numerous case studies have successfully employed GIS and remote sensing techniques to assess community vulnerability to climate change. Examples include mapping flood-prone areas, identifying regions at risk of coastal erosion, and evaluating the impact of changing precipitation patterns on agriculture:

- 1. GIS and Remote sensing in assessing the Impacts of climate change of the rift valley lakes water level.** In Kenya's Rift Valley, the lakes have been rising dramatically, causing widespread flooding and posing a severe threat to the region's development. Homes, schools, transportation networks, wildlife habitats, and even places of worship have been submerged, leading to the displacement of thousands of people and wildlife. One of the key factors contributing to this rise in water levels is climate change that has led to increased surface run-off resulting to increased soil erosion, driven by elevated human activity in the area.

This research focuses on the impact of climate change and land use and land cover changes (LULC) on the rising water levels in these lakes, with a focus on Lake Nakuru. To do so, satellite imagery from 1990 to 2020 was used to track the horizontal extent of the lake, and contour lines were generated from digital elevation models (DEM) to represent their vertical

extent. The study found that Lake Nakuru vertical extent increased by 9 meters between 1990 and 2020, and the horizontal extent grew by a staggering 88.4%.

Furthermore, the research identified a strong correlation between precipitation and rising water levels, making it a significant driver of the phenomenon. Forest cover decreased by 59.04% during this period, while built-up areas increased by 474%. Annual mean precipitation saw a remarkable 950% increase, primarily occurring between 2010 and 2020, and average temperatures rose from 23.37°C in 1990 to 24°C in 2020.

The consequences of these rising lake levels are tangible, with 178 buildings, four road networks, and a powerline submerged and destroyed around Lake Nakuru. The study concludes by recommending further research considering all potential causes of the lake level rise, utilizing higher-resolution data for accuracy, and exploring the creation of riparian zones along the lakes' shores. This research sheds light on the complex interplay of environmental and human factors contributing to the alarming rise in water levels in Kenya's Rift Valley lakes, calling for urgent attention and mitigation efforts.

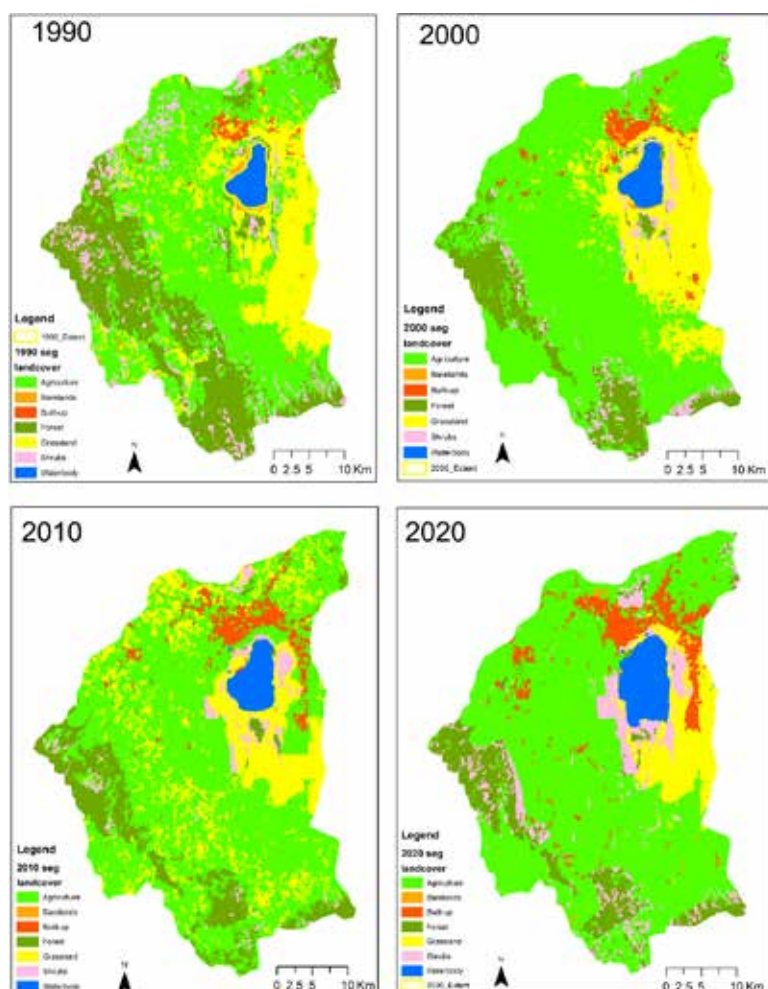
2. **Climate change vulnerability assessment using a GIS modelling approach in ASAL ecosystem: a case study of Upper Ewaso Nyiro basin, Kenya** – This study utilized GIS and remote sensing techniques to assess climate vulnerability in the Upper Ewaso Nyiro basin area. The study employed an averaging approach of indicators to derive component and vulnerability scores through spatial integration.
3. **Indexing climatic and environmental exposure of refugee camps with a case study in East Africa** – This study presents a novel approach to systematically measure climatic and environmental

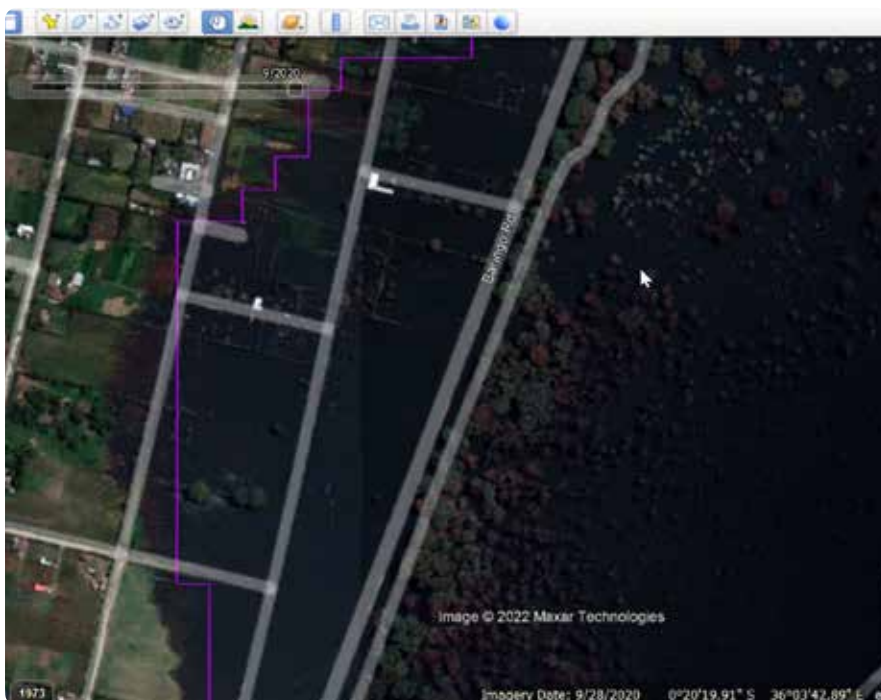
exposure in refugee camps using remote sensing techniques. The study highlights the importance of GIS and remote sensing in understanding the vulnerability of refugee populations to climate change.

4. Urban Flood Vulnerability and Risk Mapping Using Integrated Multi-Parametric AHP and GIS: Methodological Overview and Case Study Assessment –

This study demonstrates an integrated approach using GIS and Analytic Hierarchy Process (AHP) for creating flood hazard maps. By combining GIS and remote sensing data, the study assesses urban flood vulnerability and helps in decision-making for flood risk management.

These case studies showcase the application of GIS and remote sensing techniques in assessing





Lake Nakuru shore.

community vulnerability to climate change in Kenya. They provide valuable insights into mapping flood-prone areas, identifying regions at risk of coastal erosion, and evaluating the impact of changing precipitation patterns on agriculture. The findings from these studies contribute to evidence-based decision-making and enable policymakers to implement targeted adaptation measures, ultimately building resilience within vulnerable communities.

CHALLENGES AND FUTURE DIRECTIONS

GIS and remote sensing are valuable tools for assessing climate change vulnerability in Africa and to the rest of the world, but challenges exist. Reliable and current data availability, especially in remote areas, is a key concern. Technical expertise needs improvement, requiring training for effective tool use, data interpretation, and software proficiency.

Ultimately, the integration of GIS and remote sensing in climate change assessments contributes to building more resilient communities and fostering sustainable development in the face of a changing climate.

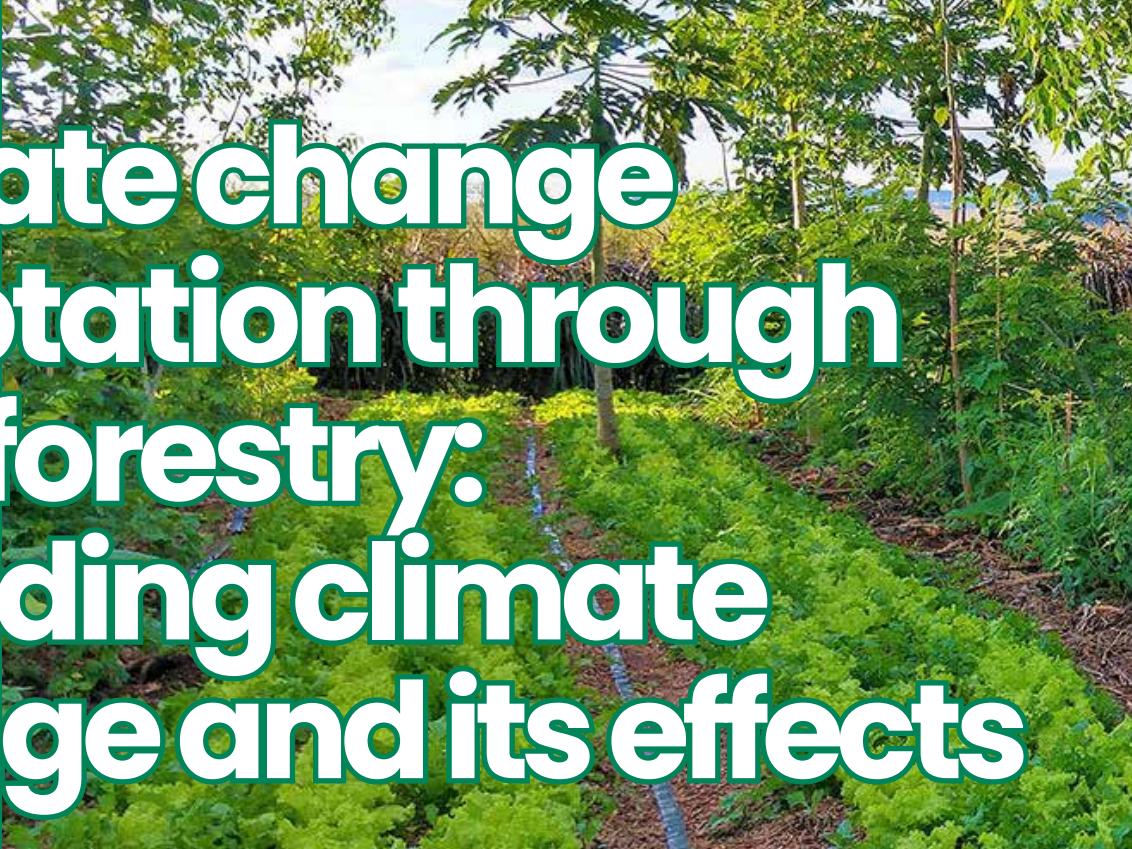
In addition, collaboration is essential for addressing vulnerability, with partnerships between researchers, policymakers, and local communities is crucial for context-specific assessments. Advanced tools, like modeling, AI, and machine learning, are needed for accurate vulnerability assessments. Integrating traditional knowledge and community engagement is vital, fostering insights and ownership. To overcome these challenges, endorsing data-sharing platforms, capacity-building, interdisciplinary collaboration, and user-friendly GIS tools can enhance vulnerability assessment effectiveness.

CONCLUSION

Assessing community vulnerability to climate change using GIS and remote sensing techniques provides a powerful framework for understanding the complex interactions between climate change and human systems. By mapping vulnerability and identifying at-risk communities, decision-makers can prioritize adaptation efforts and allocate resources effectively. Continued advancements in technology, data availability, and interdisciplinary collaboration will further enhance the accuracy and applicability of these techniques. Ultimately, the integration of GIS and remote sensing in climate change assessments contributes to building more resilient communities and fostering sustainable development in the face of a changing climate.

JARED BUOGA
Delivery Director at State Department of Housing and Urban Development

Climate change adaptation through agroforestry: Decoding climate change and its effects



The earth's surface has been experiencing a rise in temperature with consequent changes in weather patterns, a phenomenon broadly referred to as climate change. The rise in the earth's temperature is attributed to accumulation of greenhouse gases (GHG) in the atmosphere. Climate change occurs as a natural process through natural causes like volcanic eruptions. However, the recent rise in atmospheric GHGs above the pre-industrial conditions (1850-1900) is attributed to human activities.

Climate change affects the way we produce food, our water resources, settlements, energy, health, and the ecosystem. The impacts of climate change on our lives arise from exacerbating the range of existing threats as well as re-introducing or bringing in totally new threats. Current predictions show that some regions in Africa will continue to experience one or a combination of the following events: a decrease in mean precipitation, increase in heavy precipitation and pluvial flooding, increase in drying and droughts, increase in mean wind speed, and increase in river (fluvial) flooding in new places. The most common extreme weather events in Kenya are droughts and floods. A classic example of new threat exacerbated by climate change is the recent (2019-2020) desert locust that ravaged the horn of Africa.

Climate change affects food security and nutrition by altering production conditions. For a region that relies on agriculture, the most important effect of climate change is the rise in temperature and shifts in precipitation patterns. Agriculture in Africa is rainfed, suggesting that stable environmental conditions are required to obtain a good harvest. Occurrence of drought or prolonged dry season cause crop failure, while floods and pest infestation

Agroforestry is important in livestock farming systems where the trees provide fodder and shade in silvopasture systems.



destroy the crops. For example, changes in the timing of rainfall, its frequency, duration and intensity is responsible for food crop failure witnessed in most parts of Kenya. Pastoral communities in the country are also threatened by declining ground water supplies and increasing desertification. Frequent droughts, and variable rainfall make farming an uncertain and risky affair. Adaptation measures are required to help communities adjust to the effects of climate change.



Trees scattered in cropland

DEVELOPING COUNTRIES BEAR THE BRUNT OF CLIMATE CHANGE

Communities in developing countries are exposed (the most) to the effects of climate change, but

they lack the adaptive capacity. The majority of these communities live or source livelihoods in areas that are more vulnerable to natural threats. Without alternative, they cultivate or build on steep hillsides, riparian belts and other fragile areas that are prone to landslides or floods. Their livelihoods are predisposed to frequent and severe threats with far-reaching negative impacts. In addition to facing threats from climate change, these communities groan under the effects of high population, resource depletion and poverty. As a result, they do not have resources to mitigate climate risks. For example, some households in developing countries do not have assets to turn to during difficult times, or may not have savings or access to credit to tone down climate-induced risks.

AGROFORESTRY SUPPORTS ADAPTATION

Agroforestry supports adaptation in three ways that are unique to communities in developing countries, or any community elsewhere that depends on natural resources for their livelihoods: (1) provide products for communities that are experiencing hazards, (2) make farming and livestock systems more resilient to climate change, and (3) protect people and places from the impacts of climate change.

AGROFORESTRY PROVIDES FOR COMMUNITIES IN CLIMATE CRISES

Trees provide products that contribute to food security and nutrition, extra income for households in times of crisis, and ecosystem services that can reduce the impacts of climate change. Fruits are important in combating hunger and by supplying vitamins and micronutrients during the dry season when households deplete the grain harvest, and the period following prolonged drought when there is crop failure. Communities facing threats normally harvest fruits and other tree products for home consumption and also for income. Tree products such as fruits, fodder, medicines, spices and wood were previously collected in forests and semi-natural habitats. However, restrictions and conservation laws limit access to these products, making agroforestry a suitable alternative for households who depend on these products for livelihoods. Farmers with a portfolio of fruit trees are well prepared to cope with unpredictable risks of climate change.



Mango trees in eastern Kenya provide fruits for food and income when crops fail.

AGROFORESTRY FARMING AND LIVESTOCK SYSTEMS RESILIENT TO CLIMATE CHANGE

Agroforestry contributes to climate change adaptation by making farming and livestock systems more resilient. A resilient system is one that continues to



Parkland agroforestry system in Burkina Faso. Trees are scattered in the landscape and animals are allowed to graze under the trees after harvest.

provide livelihood benefits even after experiencing shocks and disturbances. Agroforestry makes farming systems resilient to climate change by regulating microclimate, crop water availability and enhancing soil organic matter. Trees moderate temperature extremes during the day and across seasons, resulting in microclimates with lower mean temperatures. For crops, moderation of temperature allows photosynthesis to take place without interruption. For farms, places with trees have higher soil moisture because of reduced evapotranspiration from the soil and crops, and reduced water loss from runoff. On the contrary, high mean temperatures and prolonged dry season increase the rate of evapotranspiration.

Agroforestry can also increase the resilience of the soils to drought and floods by building up soil organic carbon, fixing nitrogen and increasing the diversity and abundance of microbial community. Trees hold the soil by their roots and improve soil structure through organic matter input. The negative effects on crops through shading and competition for water should be managed to maximize benefits of agroforestry.

Agroforestry is important in livestock farming systems where the trees provide fodder and shade in silvopasture systems. During the dry season,



fodder trees contribute to increasing the resilience of communities who depend on livestock systems. Trees are relatively resistant to drought and therefore help farmers to adapt to climate change by providing feed resource in the absence of grass or other forage. Farmers who would otherwise resort to less nutritious crop residues (e.g. maize stover) are able to feed their animals of high protein feed.



Faidherbia albida tree with maize stovers beneath (after harvest) in Salima, Malawi. Farmers in the region harvest more maize under tree canopy compared to open places without trees.

Faidherbia albida is one of the agroforestry trees with the greatest benefits for climate change adaptation in farming and livestock systems. *Faidherbia* tree has a light canopy and exhibits reverse phenology i.e. sheds leaves during the rainy season and is in leaf during the dry season. The tree allows crops to grow without shading during the rainy season, provides high-quality pods and leaves for livestock browse and allows grass to grow beneath the canopy during the dry season. Fodder trees such as *Calliandra calothyrsus* are multipurpose and provide firewood, stakes and are also used in erosion control.

Agroforestry reduces the impacts of flooding and extreme rainfall events. Trees in the landscape reduce the speed of runoff during heavy rainfall, create windbreaks that buffers crops from storms, and protect the soil from erosion. This helps to reduce risks a flooding. Trees also reduce the impact of floods by improving water infiltration. On a steep slope, soil erosion, flooding and siltation tends to be less in areas with trees compared with those without trees. Run off and soil loss are better controlled when trees are combined with grass stripe on steep slopes. The benefits are increased soil fertility because of reduced loss of organic matter.

INCOME FOR REDUCING VULNERABILITY

Farmers need financial capital to manage risks and uncertainties. Income plays an important role in reducing food insecurity and vulnerability of households in dryland conditions or during extreme weather events. Agroforestry can boost farmers income from the sale of trees or tree products, surplus from crop raised under agroforestry, and animal products. Trees are a kind of insurance and an asset converted to cash in times of need. In addition to improved income, farmers with trees have reduced expenditure on food, fodder, firewood and construction material.

There is an opportunity to get revenue from the sale of carbon credits, although this has not been explored. An advantage of generating carbon credits via agroforestry is that the project does not disrupt livelihood systems of the locals since farmers do not need to change land use. Much of the carbon trading in Kenya is happening outside the framework of carbon trade. A framework on carbon trading would help address the challenges of high transaction costs for projects requiring aggregations of several smallholder farmers, and other challenges such as carbon or tree rights. The income, however small, would add to the farmers' capacity to adapt to extreme weather events.

DR. shem Kuyah
Head of Research and Innovations,
Jomo Kenyatta University of Technology



Transplanting tree seedlings

Green and Climate-Smart Agriculture for Climate Mitigation and Adaptation

The global climate crisis has become one of the most pressing challenges of our time. As the planet faces rising temperatures, extreme weather events, and disruptions to ecosystems, it is essential to find sustainable solutions that both mitigate the impacts of climate change and help us adapt to the changes that are already underway. Agriculture, a sector deeply intertwined with the environment, plays a pivotal role in addressing the climate crisis. This article explores the concept of green and climate-smart agriculture, its role in climate mitigation and adaptation, and the practices that can help us build a more resilient future.

UNDERSTANDING THE CLIMATE CRISIS

According to Sobczyk, Nick (2019) climate crisis is a term describing the accumulation of greenhouse gases (GHC's) in the earth's atmosphere leading to

global warming that is rising global temperatures, and climate change, and their impacts including melting ice caps, sea-level rise, severe weather-El-Nino's, shifts in precipitation patterns among others.



Farmer inspecting coffee berries

Climate change is a reality and has adversely impacted agriculture and other natural resource-based sectors of the economy (MAAIF, 2018). Over 96% of farming households in Uganda depend on rainfed agriculture (UBOS 2017), making them highly vulnerable to the adverse impacts of climate change and variability. Climate change distorts the length of rainy seasons making the farmers uncertain on when to prepare land and when to plant crops. This shift in rainy seasons negatively affects water availability for agricultural production leading to reduced crop and pasture yields. The foreseen challenge is meeting the growing population's food demand which calls for increased food production amidst a changing climate. However, Uganda's farming systems are not sufficiently developed to adequately adapt to or cope with the impacts of climate change.

Agriculture is profoundly affected by these changes, impacting crop yields, water availability, and the viability of farming practices in many regions. At the same time, conventional agricultural practices themselves contribute to climate change through GHG emissions, deforestation, and other forms of environmental degradation.

WHAT IS GREEN AND CLIMATE-SMART AGRICULTURE

According to Food and Agriculture Organization, (FAO 2023), Climate-smart agriculture (CSA) is an approach that helps guide actions to transform agri-food systems towards green and climate resilient practices. CSA supports reaching internationally agreed goals such as the SDGs and the Paris Agreement. It aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing and/or removing greenhouse gas emissions, where possible. More on: <https://www.fao.org/climate-smart-agriculture/en/>.

1. **Increased productivity:** Produce more and better food to improve nutrition security and boost incomes, especially of 75 percent of the world's poor who live in rural areas and mainly rely on agriculture for their livelihoods.

2. **Enhanced resilience:** Reduce vulnerability to drought, pests, diseases and other climate-related risks and shocks; and improve capacity to adapt and grow in the face of longer-term stresses like shortened seasons and erratic weather patterns.
3. **Reduced emissions:** Pursue lower emissions for each calorie or kilo of food produced, avoid deforestation from agriculture and identify ways to absorb carbon out of the atmosphere.

Therefore, Green and climate-smart agriculture is an approach that seeks to address the dual challenges of climate change and food security. It encompasses a range of practices and techniques that are environmentally sustainable, economically viable, and socially responsible. These practices aim to reduce GHG emissions, enhance resilience to climate impacts, and increase productivity.

KEY PRINCIPLES OF GREEN AND CLIMATE-SMART AGRICULTURE

1. **Crop Diversification:** Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm taking into account the different returns from value-added crops with complementary marketing opportunities. It includes planting a variety of crops can help reduce the risks associated with changing climate conditions. Diversification also enriches soils and increases overall farm resilience.
2. **Conservation Agriculture:** This is a method of crop production in which mechanical disturbance to the soil is kept to a minimum and other practices, such as diverse crop rotation and restoring organic matter to the soil, may be used. It aims at leaving the land in its natural state as far as possible.
3. **Agroforestry:** This is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In agroforestry systems there are both ecological and economical interactions between the different components.
4. **Precision Agriculture:** This is the use of technology in agriculture, example using GPS and laser beams and sensors in grazing animals especially cattle where



Girl planting *grevillea robusta* tree.

there is no fence but are protected from wandering around using GPS and sensors. This helps optimize resource use, leading to increased efficiency and reduced emissions.

5. Organic Farming: Organic farming, also known as ecological farming or biological farming, is an agricultural system that uses fertilizers of organic origin such as compost manure, green manure, and bone meal and places emphasis on techniques such as crop rotation and companion planting. It eliminates synthetic pesticides and fertilizers reduces chemical runoff and fosters healthier ecosystems.

6. Irrigation Efficiency: Irrigation efficiency refers to the amount of water removed from the water source that is used by the crop. This value is determined by irrigation system management, water distribution characteristics, crop water use rates, weather and soil conditions reducing water waste and improve drought resilience.

CLIMATE MITIGATION IN AGRICULTURE

Reducing Emissions: Agriculture is responsible for a significant portion of GHG emissions, primarily through methane from enteric fermentation in livestock and nitrous oxide from synthetic fertilizers. Green and climate-smart agriculture promotes techniques to reduce emissions, such as better manure management, organic farming, and improved fertilizer application.

Carbon Sequestration: Practices like cover cropping, agroforestry, and reduced tillage promote carbon sequestration in soils and vegetation, helping to offset emissions.

Renewable Energy: Implementing renewable energy sources, such as solar panels, biogas and wind turbines, on farms can help reduce emissions associated with energy use. These provide a means of mitigation to reduce the sources or enhance the sinks of greenhouse gases. Biogas reduce deforestation, that is cutting of trees for fuelwood.

Adaptation to Climate Change: This include developing Resilient Crop Varieties: Developing and planting crops that are adapted to changing climate conditions can enhance the resilience of agriculture.

Water Management: Adapting irrigation practices due to changing rainfall patterns and reducing water waste is crucial. This ensures continuous water supply especially due to unpredictable rainfall hence decreasing the vulnerability of ecosystems and societies.



Tree planting

Early Warning Systems: Early warning system is an adaptive measure for climate change, using integrated communication systems to help communities prepare for hazardous climate-related events. A successful Early Warning System saves lives and jobs, land and infrastructures and supports long-term sustainability. Farmers benefit from access to climate information and early warning systems to make informed decisions in response to weather events.

Infrastructure and Technology:

To adapt to the adverse effects of climate change, we use climate technologies such as drought-resistant crops, early warning systems and sea walls. Investments in infrastructure, such as flood protection and improved drainage, can help protect farms from extreme weather events. It plays a central role in climate change adaptation, due to its ability to safeguard the provision of essential services and protect communities from harmful climate change impacts.

Capacity Building: Farmers and communities need support and education to implement adaptive practices successfully. This include providing advisory services in terms of training farmers on crop production techniques, livestock management, organic farming, Sustainable Agricultural Landuse Management practices, sustainable farming practices, Good Agricultural Practices (GAP) among others.

BENEFITS OF GREEN AND CLIMATE-SMART AGRICULTURE

Sustainability: These practices promote a long-term, sustainable approach to agriculture, reducing the depletion of natural resources.

Economic Viability: Many climate-smart practices lead to cost savings for farmers, making their operations more economically viable.

Food Security: By making agriculture more resilient to climate change, we enhance global food security.

Biodiversity Conservation: Diverse farming systems promote biodiversity, which has a host of ecological benefits.

Improved Rural Livelihoods: Green agriculture practices can improve the well-being of rural communities by generating employment and economic opportunities.



Agriculture outreach program.

BARRIERS AND CHALLENGES

While green and climate-smart agriculture offers substantial benefits, there are challenges to its widespread adoption. These include the cost of implementing new practices, access to technology and education, and resistance to change in traditional farming communities. Policymakers and stakeholders need to address these barriers through incentives, support programs, and knowledge dissemination.

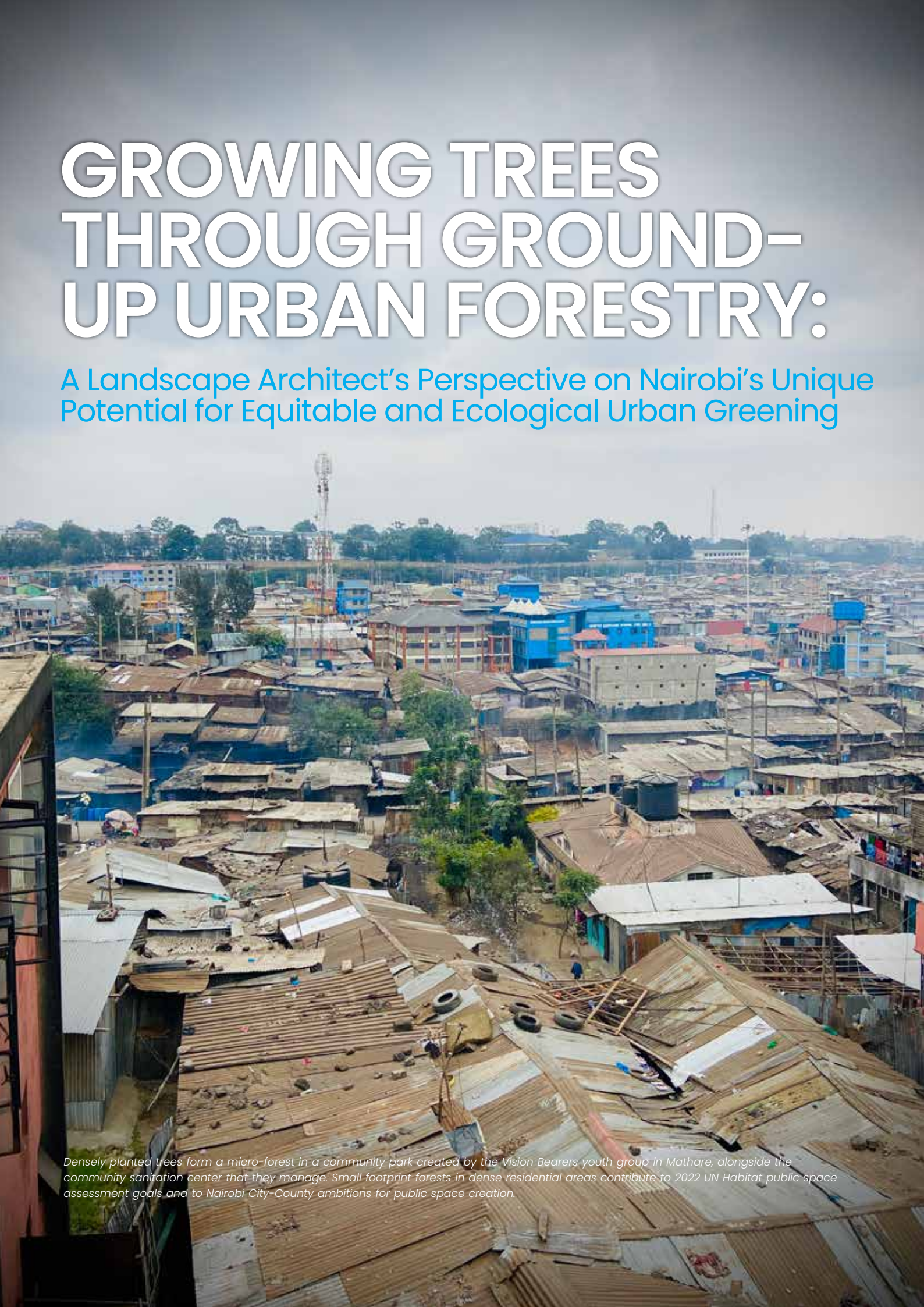
CONCLUSION

Green and climate-smart agriculture is a critical tool in addressing the climate crisis. By reducing GHG emissions, sequestering carbon, and building resilience in the face of climate change, it offers a path forward for sustainable and productive farming. Governments, farmers, and civil society must work together to promote and invest in these practices to ensure a more secure and sustainable food system in the face of an uncertain climate future. Embracing green and climate-smart agriculture is not just a solution; it's a necessity for the planet and all its inhabitants.

Nabbumba Stella, Coordinator Mpigi District Farmers Association & Abditam Shaban, Accountant, Mpigi District Farmers Association (Uganda)

GROWING TREES THROUGH GROUND- UP URBAN FORESTRY:

A Landscape Architect's Perspective on Nairobi's Unique
Potential for Equitable and Ecological Urban Greening



Densely planted trees form a micro-forest in a community park created by the Vision Bearers youth group in Mathare, alongside the community sanitation center that they manage. Small footprint forests in dense residential areas contribute to 2022 UN Habitat public space assessment goals and to Nairobi City-County ambitions for public space creation.

Nairobi is experiencing a watershed moment, as organizations ranging from the grassroots to intragovernmental levels strategize how best to use urban forestry to mitigate the effects of climate change, while also improving the quality of urban life.

Transformative projects, led by highly motivated youth groups, are forming in the low-income, informal settlements of Mathare, Korogocho, Lucky Summer, and Mukuru in the east and central areas of Nairobi. The hope and dignity that these projects represent echo the ambitions of climate action, demonstrating effectiveness on small scales. The groups creating urban forests and publicly accessible green spaces in their neighborhoods represent a large number of young people working on tangible climate actions, and include:

- Lucky Summer; Lucky summer Environmental and Waste Management Organization (LEWMO)
- Korogocho; Komb Green Solutions
- Mathare: Green Park Self-Help Youth Group, Vision Bearers, Memradi Network, Mathare Social Justice Center
- Mukuru: Dominators, Kilimatawa, Majestic Wakanda
- Kibera; Vijana Usafi Maendeleo, Whispers Champions Youth Initiative

Many of these groups are supported by Muungano wa Wanavijiji, Slum Dwellers International – Kenya, and Kounkuey Design Initiative, whose respective missions engage meaningfully with community groups to interconnect, collaborate with, and empower them.

Engaged government officials, staff, and scientists also support the aims of urban forestry in Nairobi and are open to continue doing so within the offices of Nairobi City-County Green Nairobi (Environment, Water, Food and Agriculture) and Built Environment and Urban Planning Sectors, as well as the Kenya Forestry Research Institute, which supplies many of the available tree seedlings to government and private nurseries.

Well-respected non-governmental organizations are also open to supporting these efforts, including the UN's Habitat Public Space Programme, CIFOR-ICRAF scientists, and staff in their seeds, biodiversity, spatial imaging, and partnerships departments; Stockholm Environment Institute staff; and botanists/taxonomists at the National Museum of Kenya and smaller horticulturally-focused non-governmental organizations like Darubini.

From early July to mid-August during the past six weeks, members of the organizations and groups mentioned here generously gave their time and

offered their insights during in-person meetings, site tours, and demonstrations of the projects they are doing related to urban forestry.

Today, a huge number of youth groups are organizing among themselves to adopt spaces alongside the Nairobi and Mathare rivers. Their work builds on a long history of successful community planning in informal settlements by organizations such as Muungano wa



From left: Alvin Ochieng Omondi (LEWMO), Kate (CIFOR-ICRAF, Cornell University), Emily Vivian Adung'o (Nairobi County Built Environment & Urban Planning), Grace Ojiayo Achieng (Nairobi County Asst. Director of Climate Change), Robert Muchiri (Komb Green Solutions), Maureen Bett (Nairobi County Parks & Natural Resources), Washington Boya (Youthprinua Org.)



A new community park in Mathare has transformed a former dump site into an urban forest and gathering space alongside the Mathare River, created by the Itals and Masca coalition of youth groups, with support from many others.

Wanavijiji and Slum Dwellers International – Kenya. Youth organizations are networking with and training each other to accomplish urban greening projects. An example of this is how Komb Green Solutions took the initiative to attend a series of riparian best practice trainings, led by Sam Dindi of Mazingira Yetu and others, and how it has since trained members of LEWMO, themselves now training still more youth groups. In this way, the shared goals and knowledge of climate action are facilitated by strong social networks.

Creating green spaces in proximity to riverways mitigates the danger of flooding and creates networks of open space. Youth groups are actively working to clean up and create parks alongside an approximately 9 km-long section of the Mathare and Nairobi rivers. These groups include LEWMO and Komb Green Solutions, which are working with many others. The network of groups helps one another with initial remediation efforts, while its long-term adoption is done by the local youth group in that area. Adopting riverside sites creates an attractive community amenity while improving the ecological function of the rivers. Groups and residents take

considerable pride in the beautiful spaces that are now available for them to relax and spend time in.

Many of these spaces are former dump sites, now being adopted to become urban oases. Groups mentioned in this article are creating innovative ways to educate their members, schoolchildren, and members of the wider community about waste separation and proper disposal. They are leading waste pick-ups at residential homes and arranging



A densely planted forest growing at Chiromo Campus of Univ. of Nairobi, with botanist/taxonomist Duncan Mutiso Chalo of the NGO Darubini.



Seed storage at KEFRI.

its regular collection by Nairobi City-County vehicles and working with municipal staff to strategize more solutions to solid waste. Waste is a source of wealth and steady income; this is seen in the case of an efficient sorting facility in Mathare, where Green Park Self-Help Youth Group members efficiently sort through and recycle plastics, glass, metals, and organic waste.

Inventive and inclusive new sanitation projects lay the groundwork for creating urban forests and green public open spaces in many cases. Community sanitation centers provide hot showers, clean toilets, drinking water, and clean water for washing clothes. Many centers are managed and maintained as a form of steady income by groups including Vijana Usafi Maendeleo and Whispers Champions Youth Initiative, both in Kibera, and Vision Bearers and Green Park Self-Help Youth

Group, both in Mathare. These become well-loved, safe spaces for families that are further adopted to create miniature forests and parks. Promising improvements to sanitary infrastructure are being made in the Mukuru settlement as a result of the Special Planning Area re-zoning process to connect residence compounds to sewer systems through smaller pipes, which are more easily routed through existing neighborhoods to avoid prompting evictions.

Miniature forests can be as small as 2m x 2m in size, but when they are added up, their effect is not to be underestimated. There are promising examples of dense forests being successfully created using the 'Miyawaki method', which plants varieties of trees in dense arrangements. The trees then self-organize over time according to their growth habits and shade tolerance. These living experiments can be seen at the University of Nairobi's Chiromo Campus in the Central Business District of Nairobi. These findings are further confirmed when visiting small, dense plantings throughout the Mathare settlement, where the Mathare Social Justice Center is growing trees on small areas of land. Reclaiming these leftover spaces is part of its Ecological Justice campaign, which aims to create equitable access to healthy environments.



Mathare and Nairobi rivers confluence in Dandora.

Linear forests are being created along riverways, as well as initial new projects along roadways. Cathy Watson of CIFOR-ICRAF has grown over 2,500 native trees on road reserves with the agreement of the Kenya Urban Roads Authority and the help



Caption: By creating urban forests on otherwise barren highway reserves, the number of pedestrians using this area has increased, and it is evident that they are enjoying the space while waiting for transit or taking a rest, as seen here with youth from PCEA stopping among the trees during a bike ride. Photo by Cathy Watson.

of dedicated maintenance staff. These otherwise barren and eroding strips of land were often on steep slopes and difficult to plant. Despite this, there has been a high rate of successful growth for the trees grown here. Entomologists from the Museum of Kenya have surveyed pollinators, finding a large number of bees, butterflies, and other insects. This project exemplifies a creative new partnership that is turning road reserves into biodiversity corridors.

Found among these inspirational projects are the many complexities to creating robust urban forests as climate change adaptation responses.

Rivers throughout Nairobi are polluted, clogged with solid waste (due to the lack of a comprehensive waste management strategy), human sanitary waste (due to an unhealthy lack of sewer infrastructure), and industrial waste that turns the rivers different colors at different times of day, depending on what is being dumped in them, flagrantly disregarding government policies against pollution. The danger of flooding is a real concern for residents living within proximity to the rivers – and residents often have very little choice of where else to live due to gaps in the housing system. And, while sorting waste to recycle it creates an independent source of income to take pride in, the hazards involved in doing it present a real danger to individuals. The scale of these systemic issues will require broad and committed efforts by many groups to resolve.

Encroachment within riparian zones is a real issue. The City-County is working to better enforce National Environmental Management Author-



Planting a tree with Whispers Champions Youth Initiative in Kibera. The group has nurtured Croton megalocarpus ('Croton') from seed and Morus alba ('Mulberry') grafts in upcycled containers to grow and to sell and promotes values of patience for long-term climate and social benefits.

ity riparian zone setbacks which require 15m of space on either side of river edges. Finding equitable alternatives to forced evictions is a shared

goal among community groups. Muungano wa Wanavijiji and Slum Dwellers International – Kenya are working with residents in several wards of Mathare to form a commonly held vision for their neighborhoods, focusing on river adaptations. There is hope that this process will lead to an acceptable and humane planning process as part of the Special Planning Area in Mathare, negotiating space for both the river and residents. The results of this planning process could potentially lead to the creation of new urban forestry projects and public spaces.

Fundamental rights to personal and public space security are at risk in many of the informal settlements where these positive projects are taking place. Community groups must actively protect riparian and other areas from ‘land grabber’ developers, who are highly influential. These community groups need support to do so. Many of the trees growing in both Mathare Social Justice Center and Green Park Self-Help Youth Group’s miniature forests were planted in memory of community members who have been lost due to extrajudicial killings. Urban forestry can play an important role in creating community stability and safety.

The species of trees being planted as part of urban forestry projects are not always well suited for the site conditions and are often exotic varieties not native to Kenya. This means they may be less resilient to changing climatic conditions and do not contribute to local biodiversity. Scientifically grounded approaches are well understood within a number of organizations in Nairobi, but this information is not reaching community organizations to help inform their choice of trees and create urban forestry palettes to match species to each site.

Maintenance is critically important for tree survival and the success of an urban forestry agenda as a whole. Creating green jobs that empower the

groups doing the significant labor of cleaning up these spaces for public benefit is an important goal. Coordinating budgets and preparing long-term sustainable economic models that place value on urban forests will require creative partnerships and approaches.

Urban forestry represents climate action that is manageable and doable so long as networks of individuals, community groups, non-governmental organizations, and municipal agencies are willing to ensure that the trees will thrive in the long-term and that projects to grow trees are supported by horticultural science.

Both immediate and long-term thinking is required when adapting to climate change, and the nature of trees and forests is that they work with time. Instead of being a highly technologically advanced, expensive, or theoretical approach to climate adaptation, urban forestry is a tangible, immediate, and long-term mode of adapting communities to

present and future changes.

Rather than inventing the unfamiliar, we can focus resources on the nuances of urban forestry, including appropriate species selection, species adaptation to climatic conditions, and how, where, and by whom trees are grown.

Moving forward, my research will focus on an urban forestry framework that is unique to the environment and actors in Nairobi and improving livelihoods, supporting climate adaptation, and forming new partnerships. This will build on the incredible work being done by groups in Nairobi that indicate directions where urban forestry could be moving for a climate resilient future.

KATE CHESEBROUGH
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THE VALUE OF CORRECT TREE SPECIES SELECTION AND SEED SOURCING IN ADDRESSING CLIMATE CHANGE

In a world grappling with the far-reaching impacts of climate change, the role of trees in mitigating these effects has become increasingly critical. At Kenya forestry Research Institute (KEFRI), our mission centers on harnessing scientific research to promote sustainable land management practices and enhance the resilience of ecosystems. The concept of selecting the right tree species and sourcing the appropriate seeds goes beyond simple horticulture – it becomes a vital tool in our fight against the climate crisis. Biodiversity loss and shifts in ecosystem structure and functions globally underscore the far-reaching impact of climate change. Communities reliant on ecosystems for livelihoods bear the brunt of this transformation. This article aims to illuminate strategies for biodiversity conservation through adaptation and mitigation measures.

UNDERSTANDING THE BASICS

Trees are nature's carbon absorbing champions. They have the remarkable ability to absorb carbon dioxide from the atmosphere, a key driver of global warming, and store it in their parts; trunk, branches, roots. If left unabsorbed, carbon dioxide produced by power generation, transport, industrial waste, agricultural practices, cutting down trees, and burning vegetation brings about earth's surface heating, hence changing the climate.

It is, therefore, worth noting that the effectiveness of this process is hugely dependent on the selection of appropriate tree species, planting and the trees surviving to maturity. The suitability of a species to a specific ecosystem greatly impacts ability of a tree to survive and absorb carbon. Climate change is altering the landscapes and climatic conditions that trees inhabit. Rising temperatures, shifting precipitation patterns, and an increased frequency of extreme events necessitate that we choose tree

species with inherent adaptability. Species that are resilient to changing conditions can better withstand stressors, ensuring their longevity and continued carbon capturing abilities. We shouldn't also forget that, in most cases, the trees function in absorbing carbon is secondary to other primary purposes of tree planting. Need to care for trees to full growth can't be overemphasized. Tree improvement programs are useful in ensuring that the planted trees have enhanced capacity to provide desired goods and services.

POWER OF TREE SPECIES SELECTION: SUPERIOR TREES

The selection of Superior Trees from a population of trees showing variability in traits of interest is the first step in a tree improvement program. It involves the identification of the most outstanding individual trees, based on a set criterion, depending on the desired end use. Selection is done from a larger population or stand of trees. The selected mother trees are then multiplied through vegetative propagation or



Tree seeds collection.

through seeds for the establishment of a quality seed source (clonal or seedling seed orchards). This will eventually yield high-quality seeds for subsequent use in planting programs. This selection should be done by trained individuals or Foresters as in the case of KEFRI.

SEED SOURCES

Seed source should be selected according to criteria such as age, health, growth performance and size of source. A **tree seed orchard** is the most preferred source of seed for the specified tree product due to the input of tree breeding which enhances the capacity of the trees to provide desired goods and services. **Seedling seed orchard** are raised from seedlings produced from selected parents through natural or controlled pollination. **Clonal seed orchards** are raised from selected clones propagated by grafting, cutting, air-layering or tissue culture. Seed orchards are tested through progeny to ensure that the seed collected from the orchards is of high genetic quality. As establishment of seed orchards is expensive and time consuming, it is difficult to meet seed demand exclusively from seed orchards. Tree seed is therefore also collected from **established seed stands**. **Established seed stands** are planted by collecting seed from superior performing trees to establish stands that also provide tree growers with seed that bear similar qualities in yield as seed from seed orchards. Another opportunity is to select well performing stands (**selected seed stands**) in plantations and in natural forests/stands and manage them for production of seeds of high

genetic quality. However, in terms of productivity, the seed will not match the seeds from seed orchards or established seed stand

SEED COLLECTION PROCESS

A major component of seed collection process is **seed source survey** so as to identify tree populations and individuals with desirable traits (potential seed mother trees). While collecting seeds, the main aim is to get quality seeds with a wide genetic diversity; from various mother trees. Trees established from such seed have inherent resilience to cope with impacts of climate change like prolonged droughts, floods, diseases and pests outbreak, depleted soil nutrients etc. If the seed is to grow trees with an objective of getting construction poles, posts or sawn/split timber, choose healthy mother trees with less branching, straight stems, larger diameter and healthy crown. The other considerations remain true for pulp(paper), fuelwood or agroforestry trees; except for the branching pattern. For example, trees grown for fuel should have a lot of branches for more wood. Agroforestry trees should not have a lot of branches as they will shade crops and should also be able to have leaves that enrich the soil upon dropping. The age of the seed source/mother trees so chosen must be at least twice its management lifespan also known as rotation period. Isolated trees, although frequently and profusely flowering and seeding are not suitable for seed collection since they bear the risk of being self-pollinated, resulting in hollow seeds, low germination and inferior offspring health.

The selected seed mother trees should preferably be at least 30 for the target species, 50 to 100 m away from each other, in a random manner. This ensures variability of the genetic traits. Higher genetic diversity ensures trees ecosystem adaptability and resistance to pest and diseases. The fewer mother trees you collect seeds from, the higher their inbreeding hence less adaptation potential and susceptibility to pest and diseases attack.

It is therefore worth noting that seed collection process goes beyond randomly picking tree seeds to sow. For science purposes, we have to make considerations that ensure the suitability, successful establishment, longevity, and ecological impact of tree planting initiatives. The ecological and climatic diversity across regions necessitates a strategic approach to tree planting. Choosing tree species that are not only well-suited to the local environment but also possess the ability to sequester carbon, improve soil health, and support biodiversity is paramount.

OPPORTUNITIES IN SEED COLLECTION FOR THE LOCAL COMMUNITY

Effective seed sourcing is the backbone of successful afforestation and reforestation efforts, which are the key mitigation strategies to climate change; as tree populations are essential for building resilient ecosystems. Seed scarcity is necessitated by inadequate seed sources, lack of modern equipment for seed collection, processing, testing, storage, and distribution, inadequate documentation and certification of tree seed and use of poor-quality tree seed by most stakeholders. Incorporating Indigenous Technical Knowledge (ITK) and involving local communities in tree species selection, seed collection and planting initiatives can amplify their success. Indigenous communities often hold invaluable insights into native tree species that have stood the test of time. Their traditional practices of seed collection and propagation, if improved, can contribute to the establishment of robust, climate-resilient forests. By collaborating with local communities and indigenous knowledge holders, capacity-building them, and mapping the right tree seed sources within an

ecosystem, we can easily bridge the gap of quality seed scarcity. Emphasis should be put in identifying and propagating local and/or indigenous trees that have evolved to thrive in specific climates as they possess the genetic traits needed to withstand local climate variations and contribute to ecosystem health should be a priority. However, tree seeds for commercial forest establishment like blue gum, pines, cypress, etc., should be sourced from certified seed dealers, like National Tree Seed Centre, at KEFRI, Muguga or Seedballs Kenya

ADOPTING A HOLISTIC APPROACH

Mitigating climate change through tree planting requires a holistic approach that considers ecological, social, and economic dimensions. The selection of tree species should align with local needs and aspirations, supporting sustainable livelihoods. Furthermore, involving communities in the process fosters a sense of ownership, ensuring the longevity of these initiatives.

THE CALL TO ACTION

As we delve into the complexities of climate change and its effects on biodiversity and communities, understanding the science behind tree species selection and seed sourcing becomes a beacon of hope for building resilience. As we move forward, it is imperative that our efforts to combat the climate crisis are informed by science and guided by collaboration. By sharing insights, research findings, and best practices, we contribute to a collective knowledge base that empowers individuals, communities, and policymakers alike. This article is an invitation to join hands in the journey towards a more sustainable and resilient future. It is a call to action for organizations, researchers, policymakers, and communities to recognize the pivotal role that trees play in mitigating climate change and embrace the responsibility of selecting the right species and sourcing the optimal seeds.

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COUNTERING CLIMATE CHANGE WITH RENEWABLE ENERGY



Briquettes drying at Eco2librium office in Kakamega

The climate crisis is a significant concern for the current and future generations. Human activities, such as burning fossil fuels for energy and deforestation, are causing greenhouse gas emissions that continue to increase global temperatures. This poses an unprecedented challenge to the world. Therefore, we must join hands to address every aspect of our daily lives that contributes to this problem. Renewable energy offers a convincing option to replace conventional fossil fuels, providing an effective solution to combat climate change. Sustainable development principles align with renewable energy, meeting the present needs without compromising the ability of future generations to meet their own needs. By reducing greenhouse gas emissions, promoting economic

growth, protecting the environment for future generations, and enhancing the lives of millions of people worldwide, we can make a positive impact on our planet.

The climate emergency which is a multifaceted issue that affects not just the environment, but also society and the economy, is here with us! Across Kenya, communities today are suffering the consequences of climate change. Due to a devastating drought, millions of people in Kenya and the rest of Africa have been hard hit by famine. Unfortunately, many vulnerable communities that are not major contributors to greenhouse gas emissions are the ones suffering from the impacts of climate-related disasters. The effects of climate change

ripple through various sectors, including agriculture, infrastructure, and industries, and are now threatening livelihoods and economic stability. For instance, Kenya has experienced high inflation rates and shortages of basic products, causing significant pain to its communities. This situation can be partially attributed to the climate change crisis that has exacerbated the issue. According to Musafiri, C. M (2022) in a paper titled "Smallholders' adaptation to climate change in Western Kenya", climate change has contributed to reduced crop productivity by 53%, crop failure (28%), and increased food insecurity (24%).

Business companies can play a significant role in combating climate change by integrating renewable energy into their operations. Doing so not only helps reduce their carbon footprint but can also lead to cost savings, improved brand reputation, and increased stakeholder engagement. For the past 12 years, Eco2librium or Eco2 (www.eco2librium.net), a conservation-based company that uses business as a force for good to promote environmental conservation and improving the livelihoods of the local community while mitigating climate change, has been implementing renewable energy projects in western Kenya in partnership with the local community groups and other like-minded organizations. Eco2's experience working with partner communities has taught us that people would prefer not to exploit forest resources if they had alternative means of accessing the resources they need or the income they derive from them. This lesson has led us to develop sustainable and inclusive renewable energy business models that not only address energy needs but also create jobs for women and other community members.

Eco2's mission is mitigating climate change and enhancing sustainability. During this period, we have expanded our energy-efficient cookstove interventions to a majority of Western Kenya Counties, completed a pilot of the renewable biomass fuel project, and implemented reforestation projects while creating income for the communities we work with. Our projects have reduced greenhouse gas

emissions by 1.16 million tons, conserved 5,000 acres of tropical forest, provided over 500 quality jobs for underserved people, mainly women, and improved the health and livelihoods of 250,000 people.

Biomass briquettes made from renewable sources can be used as a sustainable alternative to charcoal produced from trees. Eco2 Renewable briquettes are made primarily from sugar cane bagasse, a fibrous biomass resulting from the commercial production of sugar. Charcoal burning is one of the major causes of deforestation and this project is working to tackle unsustainable wood charcoal production. The objective is to replace a non-renewable biomass fuel (charcoal) with a renewable biomass fuel (sugarcane waste briquettes) in Kenya. These carbonized briquettes offer several benefits in the fight against climate change, including reducing deforestation, lowering greenhouse gas emissions, improving cooking efficiency, and managing waste. However, it is crucial to ensure that sustainable practices are followed during their production to avoid deforestation and unsustainable agricultural practices. Additionally, minimizing the carbon footprint associated with transportation and distribution is essential. To encourage the use of carbonized briquettes as a climate-friendly alternative, a comprehensive approach including education, incentives, and policy support is necessary.

Our renewable energy projects in Western Kenya aim to alleviate the pressures facing the Kakamega Tropical Rainforest, which is the only one of its kind in Kenya. The Kakamega tropical rainforest, like other tropical rainforests, plays an important role in combating climate change through its ecological and environmental functions. Trees and vegetation in the Kakamega forest absorb carbon dioxide (CO₂) from the atmosphere during photosynthesis and store carbon in their biomass, which helps to reduce the concentration of CO₂, a greenhouse gas responsible for global warming. The dense vegetation and rich biodiversity of the Kakamega forest contribute to its significant carbon sequestration capacity. By embracing renewable energy projects, we not only

reduce emissions, but also promote biodiversity conservation, local climate regulation, water cycle management, support for indigenous communities, economic opportunities, research, education, and sustainable development while ensuring a continued role in climate change mitigation and adaptation strategies.

In addition, Solibrium Limited, a subsidiary of Eco2librium, has been providing thousands of affordable solar home systems to rural communities since 2016. This initiative helps to reduce indoor air pollution and minimize the risk of burns, fire hazards, and poisoning from the use of kerosene lamps. We strongly believe that everyone deserves access to resources, technology, education, and ethical business practices to improve their lives and communities. However, it is important to note that solar products usually have end-of-life and if not properly disposed of, the electronic waste can be hazardous to the environment and thwart the efforts to combat climate change. We carried out a project whose aim was to determine the Carbon Footprint and Environmental Impact of solar home systems and how to integrate resource efficiency measures and end-of-life management. Our objectives were to identify resource efficiency measures to extend the life span of solar products; ways to tackle e-waste management beyond the granted warranty period, and identify business approaches/economically viable solutions for e-waste management including new battery generations such as li-ion.

We employed a Life-Cycle-Assessment (LCA) approach, a scientific method to assess environmental impacts associated with all the stages of a product's life from raw material extraction through materials processing, manufacture, distribution, utility, maintenance, and disposal. Solar home systems produce carbon emissions and environmental impacts in all the life cycle stages i.e., Production, Transport, Use Phase, and also at the End of life where proper e-waste management is required e.g., recycling, incineration, Landfill, etc. The main contributors to the environmental impact are solar

panels and batteries because these components consist of rare earth elements and valuable metals. The metals and plastics recovered from old solar home systems can be reused in the manufacturing of new products and are therefore calculated as positive environmental impact benefits. Unfortunately, the business case for life extension and proper recycling and disposal systems is still very weak, and as such, additional investment is needed from key stakeholders, matched by legislation that will incentivize positive practices by both manufacturers, retailers and users. There is also the need to improve global access to supply chains for renewable energy technologies components and raw materials.

In conclusion, the shift to renewable energy brings immense environmental benefits including reduced air pollution, improved air quality, and climate change mitigation. Using renewable energy offers a wide range of advantages that contribute to both environmental sustainability and economic growth. By improving the efficiency of renewable energy technologies like biofuels, wind, and solar, we can jointly, help ensure that renewables are leveraged in the effort to counter the climate crisis. Collaboration and interdisciplinary approaches are key to successfully embracing renewable energy to combat climate change. Therefore, governments, businesses, and individuals need to work together to expedite the transition towards a sustainable and resilient energy future. The renewable energy sector has the potential to generate millions of jobs worldwide, promote technological innovation, and stimulate economic growth in both developed and developing nations like Kenya. By embracing these clean and limitless sources of energy, we not only combat climate change but also forge a path towards a sustainable and thriving future for generations to come. The time to act is now.

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Navigating the Climate Crisis:

Thogoto CFA'S Remarkable Journey of Conservation

Chris Kihonge Wambugu
Coordinator, Thogoto Forest Family Youth Group



Thogoto CFA meeting

In recent years, our planet has borne witness to a rapid escalation of extreme climatic events – a harrowing symphony of accelerated warming, flooding, polar glacial melting, droughts, and hailstorms. These events, often cataclysmic in nature, have been attributed to the relentless warming of the global atmosphere, fueled by the unprecedented emission of greenhouse gases largely stemming from human activities. The consequences are profound and pervasive, encompassing not only the natural world but also the communities that directly depend on it for their sustenance.

As greenhouse gases surge into the atmosphere, the mobilization of carbon, nitrogen, and phosphorus from the earth has undergone a drastic transformation. The burning of fossil fuels, alteration of land covers, and excessive use of fertilizers have fueled this atmospheric revolution, ushering in a new era of climatic disruption. The consequences of this phenomenon are far-reaching, threatening biodiversity, ecosystem structures, and the invaluable services they provide across the globe.



Thogoto Forest Family officials

The impact is particularly poignant in regions like Thogoto, where communities depend heavily on the delicate balance of ecosystems for their livelihoods. The fingerprints of climate change are visible not only in the altered phenology and shifting ranges of species but also in the perturbed ecosystems that sustain life. The threat to current biomes looms large, as alterations in species behavior and distribution jeopardize the fine equilibrium that has existed for millennia.

Amid this turmoil, the Thogoto Forest Community Conservation Association (Thogoto CFA) has emerged as a beacon of hope. Founded in 2005, Thogoto CFA, in partnership with Kenya Forest Service, is a testament to the power of community-led conservation efforts. By establishing a Participatory Forest Management Plan, the association embarked on a journey to harmonize the needs of local communities with the preservation of their environment.

A case in point is the Thogoto Forest Family, a dynamic group of local youths working under the Thogoto CFA's umbrella. In collaboration with Millennium Community Development Initiatives (MCDI), they have championed initiatives that bridge the gap between environmental conservation and community well-being. Recognizing the scarcity of young voices, MCDI's involvement ignited a resurgence of youth engagement within Thogoto CFA.

One of the remarkable projects born from a collaboration between Thogoto CFA and MCDI is

the Karinde Water Project at Thogoto Forest, which brought relief to the Karinde village. Notably, the project's success was largely attributable to the dedication of Thogoto CFA's women. Their tireless efforts not only provided water to a community in need but also illustrated the indispensable role that women play in climate resilience.

Furthermore, Thogoto Forest Family's affiliation with ecotourism underscores the potential for sustainable development in harmony with nature. Through strategic initiatives like nature trails, picnic sites, and cycling routes, they aim to not only generate awareness about the significance of indigenous forests but also increase the coverage of these vital ecosystems within Thogoto Forest.

While Thogoto Forest spans 764 hectares, the indigenous forest section of it is only 53 hectares. This indigenous section is the source of the Athi Springs that are the source of the Mbagathi River. The springs within the forest provide domestic water for the surrounding communities, while the Mbagathi River supplies many communities downstream with water, including serving as the southern boundary of the wildlife-rich Nairobi National Park.

To secure the forest's future, Thogoto Forest Family follows a strategic approach that involves resource packaging and pricing, mirroring a business model. This approach requires startup capital, which they are diligently working to secure through strategies like monthly contributions and proposal writing.

Thogoto Forest Family's actions resonate far beyond their immediate community. Their partnership network, including the Kenya Forest Service, Kenya Forestry Research Institute, MCDI, and local and international organizations, amplifies their impact. Their diligent efforts to engage local youths not only foster a sense of ownership but also contribute to the protection and conservation of Thogoto Forest.

In a broader context, Thogoto Forest Family's endeavors align with global efforts to combat climate

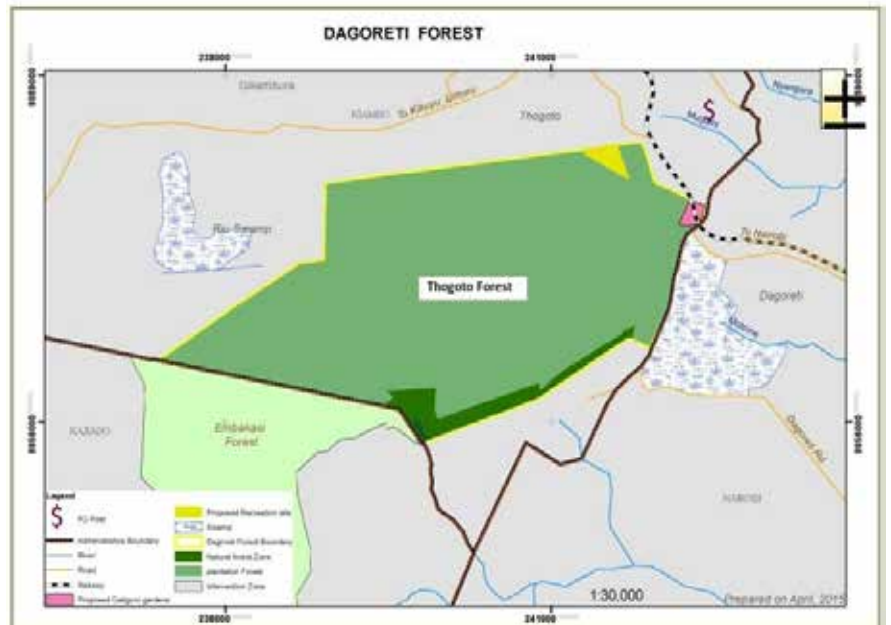


TFF Treasure Hunt August 2023

Thogoto CFA, through initiatives like Thogoto Forest Family, showcases that meaningful change begins at the grassroots level, and that the intertwining challenges of climate change and social inequities can be tackled hand in hand. The story of MCDI, Thogoto CFA and Thogoto Forest Family is a testament to the power of collective action, proving that by working together, communities can usher in a future that is resilient, sustainable, and prosperous for all.

change. As international initiatives like COP 27, the Africa Climate Action Summit, and COP 28 take center stage, Thogoto Forest Family's grassroots actions resonate as a testament to the local solutions that play a pivotal role in the larger battle.

Through the lens of Thogoto CFA's efforts, we witness the power of community forestry in mitigating and adapting to the climate crisis. By fostering a harmonious balance between environmental conservation and community well-being, they exemplify the essence of sustainability.



Map of Thogoto Forest also known as the Dagoreti Forest Block



Thogoto CFA women's treat to Nairobi National Park, July 2023



"Across the world, increasingly dangerous weather patterns and devastating storms are abruptly ending the long-running debate over the reality of climate change. Not only is it real, but it's also here, and its effects are giving rise to frighteningly new global phenomenon: the man-made natural disaster." Barack Obama

WELCOME TO THE ANTHROPOCENE:

The climate crisis and the predicament of Katonga and Bududa communities

In March 2020, Uganda was shocked by the news of a landslide in Bududa district that wreaked havoc. The landslide was as a result of the loosening of the soils following the onset of torrential rains on the 25th of February 2010. Nametsi Village was hit the hardest, as 365 people died following a **debris flow on the 1st of March**. Houses, markets, as well as churches were destroyed, roads were blocked, loss of life, livestock and property, and destruction of infrastructure.

Several people were reported missing including children who had taken shelter in a health center that was subsequently destroyed due to further extreme weather events.

Authorities promptly employed a disaster response strategy to help the affected persons which included distributing relief items, offering medical care, and eventual relocation of the displaced person. After handling the crisis, authorities felt the situation had been comprehensively addressed, but little did we know that this was only the beginning of what would become the 'new normal' around the Elgon Mountain areas.

Bududa district, located about 275km (170 miles) north-east of the capital Kampala nestled in the vicinity of Mount Elgon, has earned a notorious reputation as a **landslide-prone zone within Uganda**. The erosion of slopes caused by these landslides poses a critical issue in the region, not only affecting humans' but also far-reaching environmental repercussions and the specter of future food shortages.

THE HISTORY OF LANDSLIDES IN BUDUDA

The landslide-prone areas in Uganda include Rwenzori, Mount Elgon and the Kigezi regions. These are characterized by dense populations making them high-risk areas. **Landslides have been occurring in Bududa and historical** accounts reveal that between 1997 to 1999, the relentless onslaught of 66 landslides claimed the lives of 48 individuals and displaced more than 10,000 (Kitutu, 2004). However, recent landslide occurrences have been more catastrophic compared to those in the past. The grim toll continued into the subsequent years, with 2010 and 2011 bearing witness to the tragic loss of around 380 lives due to landslides within this very region. In October 2018, over 20 people were killed in landslides, and on 3rd December 2019, a downpour that lasted almost 11 hours led to landslides and movement of soil mass down the steep hills of Bududa district that killed over 28 people and 499 houses destroyed affecting the 6 villages of Bushika, Bushibekye, and **Bunabutiti Sub Counties**.

WHAT EXACTLY IS CAUSING THE RAMPANT LANDSLIDES?

Bududa's location on the slopes of Mountain Elgon makes it prone to landslides. This coupled with the unusual increase in rainfall patterns escalates the hazards to disasters. The Mount Elgon area has a moist to moderately dry climate, with annual average precipitation ranging from 1000 to 2500 mm, over twice the national average of 1200mm. The Anthropocene epoch seems to be one of the catalyzing agents of the rampant disasters. Climate change impacts that include extreme rainfall events, hailstorms and unpredictable rainfall frequency become worse once they fuse with unsustainable destructive human activities.

The only source of livelihood for local communities around Elgon Mountain is depending on **land for their survival** with 69% of the households depending on **subsistence farming for their income**. They carry out Agricultural activities that involve the cultivation of crops like bananas, beans, maize, cassava, coffee, tea, sweet potatoes, groundnuts, and livestock rearing. The residents have narrated how fertile the slopes are and most of them have never experienced hunger. The Elgon mountains have very **rich fertile soils for Arabica coffee cultivation** with the region being among the leaders in Uganda's coffee production. When rescue interventions come, there is a dilemma between leaving the **fertile ancestral lands and moving to other areas**. Their fear is that most government interventions of relocating them end up sending them to areas with poor **soil conditions that worsen their livelihoods**.

The population of Bududa is high with reports showing that 1,059 people live in every kilometer. This is seven times the **national average of 161 persons per square kilometer**.

A study conducted by UNESCO reveals that the level of Education in the district of Bududa is low. 10% of the population have not attained formal education and 60% have only attained up to primary level way below the **Uganda literacy rate of 76.53%**. This

could partly explain some of the reasons why the locals are moving to the steep slopes and **why the environmental problems are immense**. They are cultivating the slopes, where most of the land is loose. That is one of the reasons landslides have increased annually and yet in the past a landslide would occur after 10 years. The locals have cut most of the trees that existed on the slopes without questioning the likely impacts this could have on the fragile soils. Trees play an important role in stabilizing steep slopes by reducing soil erosion occurrences, binding soil particles together, and covering the soil. However, in Bududa, unsustainable Agricultural practices have led to the clearing of the vegetation cover, and no forests were left behind. More intense precipitation events that can be continuous for up to two days worsen the situation coupled with the lack of vegetation cover such as trees and undergrowth to reduce soil erosion which weakens the soil structure.

WHAT CAN BE DONE?

Nature-based solutions can provide sustainable solutions. Mountain slopes are fragile lands that are prone to soil erosion and thus landslides. Serious afforestation and reafforestation programs are needed to cover these bare grounds with vegetation. Of course, we can also employ hybrid methods like mechanization mixed with vegetation planting however this might be costly. Maintaining or promoting the planting of indigenous tree species that are adapted to the local solutions and Agroforestry systems could offer some solutions. Grasses like the case of steep slopes in India can also stabilize slopes and **reduce landslides occurrence**.

If the unexpected rainfall amounts increase, these will worsen the situation. To counter this, settlement patterns need to be changed, promoting community sensitization, encouraging family planning, relocating people from risk areas, and creating alternative income-generating activities. This is crucial to lessen pressure on land. Steep slopes and **dykes should be avoided for settlement purposes**.

THE KATONGA RIVER

River Katonga is located in southwestern Uganda and runs over 220 km flowing from Lake Victoria northwards into Lake Wamala and then to Lake Edward. The history of the Katonga River is complex and multi-layered, with different groups of people holding different views of the river. For some, it is a reminder of the tragic events that took place during the wars of the 1980s, while for others it is a source of food and livelihood. The different perceptions of the river reflect the diverse experiences and histories of the people who live along its banks. It also highlights the complex relationship between humans and the environment and the way that history and **memory can shape that relationship**.

The Katonga River has been expanding over time and the first reports were reported according to The New Vision in 2000 with locals claiming that the river was slowly turning into a lake. During this period, Uganda received heavy amounts of rainfall leading to an increase in the water levels of the river. This made the elders start reporting that the gods had decided to turn the river into a lake. The history of Lake Wamala and Nalubaale (Victoria) as narrated by elders is that Nalubaale, Katonga, and Wamala are gods who are related and responsible for the waters in these water bodies and want to turn River Katonga into a lake. However, this is not the cause, and it is evident that the changes are an impact of climate change that is being accelerated by anthropogenic activities.

It has been 4 months since the 11th of May when the Katonga River burst its banks leading to flooding. The floods cut off the movement of people from Kampala to the Masaka and western parts of Uganda.

The story of the Katonga River's expansion and the flooding events that have followed is a fascinating example of how climate change and human activities can interact to cause environmental problems. The elders' belief that the gods are responsible for these events is understandable, given their traditional understanding of the world. However, the scientific

evidence shows that these events are the result of a combination of natural processes and human activities, not the will of the gods. This is a reminder that it is important to have a clear understanding of the causes of environmental problems so that we can develop effective solutions.

Flood events have indeed been happening in Uganda for a long time, but they have become more severe in recent years due to the combined effects of climate change and poor land management practices. Flood mitigation is one of the many benefits that wetlands provide, but this can only be achieved if the wetlands are intact and not fragmented by human activities such as rice farming. Degraded wetlands lose their ability to absorb and store water, leading to more frequent and severe flooding.

Poverty and ineffective policies are also contributing factors to the degradation of wetlands. As the population increases, people have resorted to cultivating the wetlands and relying on them for water supply and farming. Brickmaking has led to the reclamation and degradation of wetlands. These anthropogenic pressures are exacerbated by climate change, which can cause increased droughts and extreme weather events that further degrade the wetlands.

The unsustainable practices are a major contributor to wetland degradation, and their cumulative effects are evident in the form of increased flooding and other environmental issues. This is a clear example of the Anthropocene, the geological epoch where humans have become the dominant force shaping the Earth's systems. These practices are not sustainable in the long term, and may lead to a lost war against nature. The need for social discipline and a change in mindset is crucial to reversing this trend.

Nature is a vital fabric of our society and economy, and it is our moral responsibility to coexist with it rather than destroy it for short-term gain. To achieve this goal, we must collaborate to end environmental destruction, cultivate social norms that discourage activities that endanger the environment, while

holding violators of these norms accountable. It is imperative that we recognize the value of nature sooner rather than later, to ensure a **sustainable future for our planet and all its inhabitants**.

The government must play its role in strengthening environmental protection laws and enforcing them with swift consequences. Local leaders and law enforcement must be held responsible for their mandate of holding the environment in trust for their people, and NEMA should develop a framework to recognize and reward those making efforts to conserve the environment while punishing those who engage in activities that harm it. It is important to note that inaction is a decision in itself, and we must decide to take action now to protect our environment.

In conclusion the cases of Katonga and Bududa show the interconnectedness of human activities, climate change, and environmental disasters. In both cases, human activities such as deforestation, unplanned infrastructural development, and poor land management have led to increased erosion and destabilization of the land, which makes it more vulnerable to the impacts of climate change. The resulting floods and landslides have had devastating impacts on the communities living in those areas. It's a clear illustration of how the Anthropocene is a time of both human-driven change and increased vulnerability to the effects of climate change. This highlights the urgent need for action on climate change and human-induced environmental degradation. While local efforts such as reforestation and improved land management can help to mitigate the impacts, the scale of the problem that is climate change requires global action. Only by working together, we hope to avert even greater disasters in the future. Climate Change is real and already happening.

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OYU Green:

INNOVATIVE CLIMATE PROJECTS



Mangrove tree seedlings planting.

OYU Green Pte Ltd Climate change presents an urgent and unique challenge to our world, requiring swift and unified action. OYU Green stands at the forefront of environmental safeguarding in Africa and Asia, actively engaged in combatting carbon emissions and ecological deterioration. Through innovative climate projects, OYU Green has established a new benchmark for proactive climate initiatives. From introducing clean cooking solutions to marginalized communities, curbing greenhouse gases, to fostering afforestation and agroforestry for comprehensive carbon outcomes, OYU Green not only mitigates emissions but also uplifts vulnerable communities.

With a forthcoming project centered in Kenya, OYU Green spotlights the significance of community-led endeavors in the fight against climate change. By focusing on mangrove restoration in Kwale and Kilifi regions, OYU Green champions the pivotal role with the communities. This strategic mangrove restoration effort not only bolsters unparalleled carbon absorption potential but also cultivates essential habitats for a diverse array of flora and fauna, nurturing biodiversity and coastal ecosystems.

Stand with us today in the battle against climate change!

Ekta Shrivastava
Global Carbon Offset Developer, OYU GREEN



CLIMATE CHANGE AND ITS IMPACT ON GLOBAL HEALTH:

A FOCUS ON KENYA

Climate change is a pressing global issue that has garnered significant attention in recent decades. It refers to long-term alterations in temperature, weather patterns, and environmental conditions on Earth. Over the past 30 years, climate change has accelerated, leading to far-reaching consequences for ecosystems, economies, and human health. This article aims to explore the evolution of climate change over the past three decades, its current state, and its potential impact on diseases worldwide, with a special focus on Kenya.

Three decades ago, discussions surrounding climate change were primarily confined to scientific circles and environmental advocacy groups. While there

were indications of a warming trend and concerns about greenhouse gas emissions, the urgency of the matter was not widely recognized. Scientific data pointed to an increase in global temperatures, melting polar ice caps, and shifting weather patterns, but public awareness and policy responses were limited. Today, climate change has become an undeniable reality. The Earth's average temperature has risen, leading to a wide array of observable impacts. Glaciers are melting at unprecedented rates, sea levels are rising, and extreme weather events, such as hurricanes, droughts, and wildfires, have become more frequent and severe. These changes have significant repercussions for ecosystems and human societies, ranging from food security and

water resources to displacement of communities and loss of biodiversity. Future projections indicate that if current trends persist, the impacts of climate change will intensify. Models suggest more frequent and severe weather events, prolonged periods of extreme heat, and disruptions to agriculture and water supply systems. Coastal regions will face increased risks from sea-level rise, and vulnerable communities will experience heightened health risks due to a range of factors, including heat stress, malnutrition, and spread of diseases.

One of the most concerning aspects of climate change is its impact on global health, particularly in relation to infectious diseases. Changes in temperature, humidity, and precipitation patterns create conducive environments for the proliferation of disease vectors and pathogens. Diseases like Malaria, schistosomiasis, and Arboviruses (e.g., Dengue, Zika, Chikungunya) are particularly sensitive to climatic conditions. Kenya, situated on the equator, is highly susceptible to the effects of climate change. Its population is exposed to a range of climate-sensitive diseases, including Malaria, schistosomiasis, and various Arboviruses. Rising temperatures and altered precipitation patterns create favourable breeding grounds for mosquitoes, which are the primary vectors for Malaria and Arboviruses, while availability of more freshwater bodies increase the risk of schistosomiasis transmission.

For **Malaria**– primarily transmitted by female *Anopheles* mosquitoes, and **Arboviruses**– primarily transmitted by *Aedes* mosquitoes, as temperatures rise, the geographic range of mosquitoes expand, allowing them to thrive in areas previously unsuitable for their survival. This extends the transmission areas for Malaria, putting more people at risk. The rise in temperatures also fastens development of viruses within mosquitoes, thus reducing the incubation period and increasing the likelihood of transmission of Arboviruses. Additionally, changes in precipitation patterns can create stagnant water pools, providing ideal breeding grounds perfect for mosquito breeding. Schistosomiasis on the other

hand, is caused by parasitic worms that inhabit freshwater snails. Elevated temperatures accelerate the parasite's lifecycle, thus increasing the density of infected snails and the risk of human transmission. Changes in rainfall patterns can also lead to the expansion of suitable habitats for both the snails and the parasites, as the parasite's lifecycle is intimately linked to freshwater bodies.

Implementing Integrated Vector Management (IVM) strategies, which include a combination of approaches such as insecticide-treated bed nets, indoor residual spraying, spatial repellents, larval source management, and community education, can significantly reduce vector populations and disease transmission. We also need to build climate-resilient healthcare systems, and climate-resilient water and sanitation infrastructure. Strengthening healthcare infrastructure and building adaptive capacity to respond to climate-related health emergencies is crucial. This includes training healthcare workers, ensuring access to essential medicines, and improving early warning systems for disease outbreaks. Furthermore, implementing water resource management strategies, such as rainwater harvesting and improved sanitation facilities, can help mitigate the impact of climate change on waterborne diseases like schistosomiasis.

In conclusion, climate change is a complex and multifaceted challenge that has profound implications for global health. In Kenya, as in many other regions, the effects of climate change on diseases like Malaria, schistosomiasis, and Arboviruses are evident. However, through targeted interventions, including IVM, resilient healthcare systems, and improved water and sanitation infrastructure, it is possible to mitigate the impact of climate change on these diseases and protect the health and well-being of vulnerable populations. Taking action now is not only a matter of public health priority but also a critical step towards building a sustainable and resilient future for all.

Bryan Nyawanda, Senior Biostatistician and
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Revolutionizing Waste Management in Kenya:

KEPRO's Waste Collectors Toolkit Leading the Charge

In the face of escalating environmental concerns, waste management has risen as a critical challenge globally. Kenya, a country experiencing rapid urbanization and population growth, grapples with the repercussions of inadequate waste collection and disposal systems. With approximately 22 million tons of waste generated daily, the need for innovative solutions has never been more urgent.

Like many developing nations, Kenya faces substantial obstacles in waste management. The current infrastructure struggles to keep pace with the rising volume of waste, leading to environmental degradation, health risks, and compromised public spaces. While informal waste collection practices offer a crucial service, they often lack efficiency and fail to address the scale of the issue.

Responding to this pressing challenge, the Kenya Extended Producer Responsibility Organization (KEPRO) has launched a revolutionary initiative—the Waste Collectors Toolkit, targeting Waste Collectors, Government Bodies, Non-Governmental Organizations, Community-Based Organizations, and business communities. This comprehensive toolkit aims to transform waste collection practices in Kenya, empowering waste collectors with the necessary tools and resources to enhance efficiency, safety, and sustainability. Waste collectors play a pivotal role in the value chain by simplifying waste collection, sorting, transportation, and resource recovery. They seek to develop environmentally friendly waste management practices, resource conservation, and environmental protection.



Launch of the Waste Collectors' Toolkit

KEPRO aims to integrate them through:

- Collaboration and Partnership: Fostering alliances between waste collectors, governmental bodies, NGOs, and businesses to create a unified front for effective waste management.
- Training and Capacity Building: Equipping waste collectors with the necessary skills and knowledge to handle waste efficiently, ensuring safe practices and optimal resource utilization.
- Supporting Facilities and Equipment: Providing access to essential facilities and equipment to enhance waste collection operations and safety measures.
- Public Awareness and Engagement: Initiating campaigns to engage communities, raise awareness about responsible waste disposal, and encourage active participation in waste management practices.
- Guidelines and Standardization: Establishing standardized procedures and guidelines for waste collection, sorting, and disposal to ensure uniformity and efficiency in operations.

The Waste Collectors Toolkit encompasses essential elements for waste collectors. It includes safety protocols and equipment guidelines, providing proper gear and handling methods for hazardous items. Additionally, community engagement tools facilitate communication, encourage reporting, and promote neighborhood involvement. Waste sorting guidelines emphasize efficient segregation to reduce contamination and boost recycling. The toolkit also features case studies displaying successful waste management strategies and references for further reading. Finally, it highlights best practices, such as route optimization and community engagement, contributing to the formalization of waste collection businesses.

The Sustainable Waste Management Act, 2022 underscores the need for a formalized structure. Establishing organized groups, such as cooperatives, presents an avenue for recognition and integration into policy-making processes. The toolkit meticulously explains why waste collectors need to formalize their

businesses through cooperatives. These cooperatives amplify collective voices, foster representation in policy formulation, create employment opportunities through financial schemes like savings and credit cooperatives, enable access to services, offer capacity-building programs, and raise public awareness about the crucial role of waste pickers/collectors.

Formalizing waste collection businesses is pivotal for waste collectors as it offers legal recognition, access to resources, and financial stability. By registering their operations, waste collectors gain legal protections, ensuring fair treatment and dispute resolution. Formalization facilitates professional development through training programs, enhancing skills and knowledge of sustainable waste management. Moreover, it grants market credibility, improving access to clients and fostering compliance with environmental regulations. Overall, formalization empowers waste collectors, integrates them into formal waste management systems, and while at it promotes environmentally responsible practices. It is important to transform waste collection into an organized business as this will play a crucial role helping Kenya accelerate recycling even as we hope to achieve a circular economy.

As KEPRO continues to roll out the Waste Collectors Toolkit, the organization remains committed to collaborating with local communities, government bodies, and environmental stakeholders. By fostering a culture of responsible waste management, KEPRO aims to inspire positive change and contribute to Kenya's journey towards a greener and more environmentally conscious future.

In conclusion, the Waste Collectors Toolkit stands as a beacon of innovation in the realm of waste management, signaling a transformative shift in how Kenya addresses its waste challenges. Through strategic initiatives and collaborative efforts, KEPRO is paving the way for a cleaner, more sustainable tomorrow.

Joan Tarei
Corporate Communications Officer
KEPRO

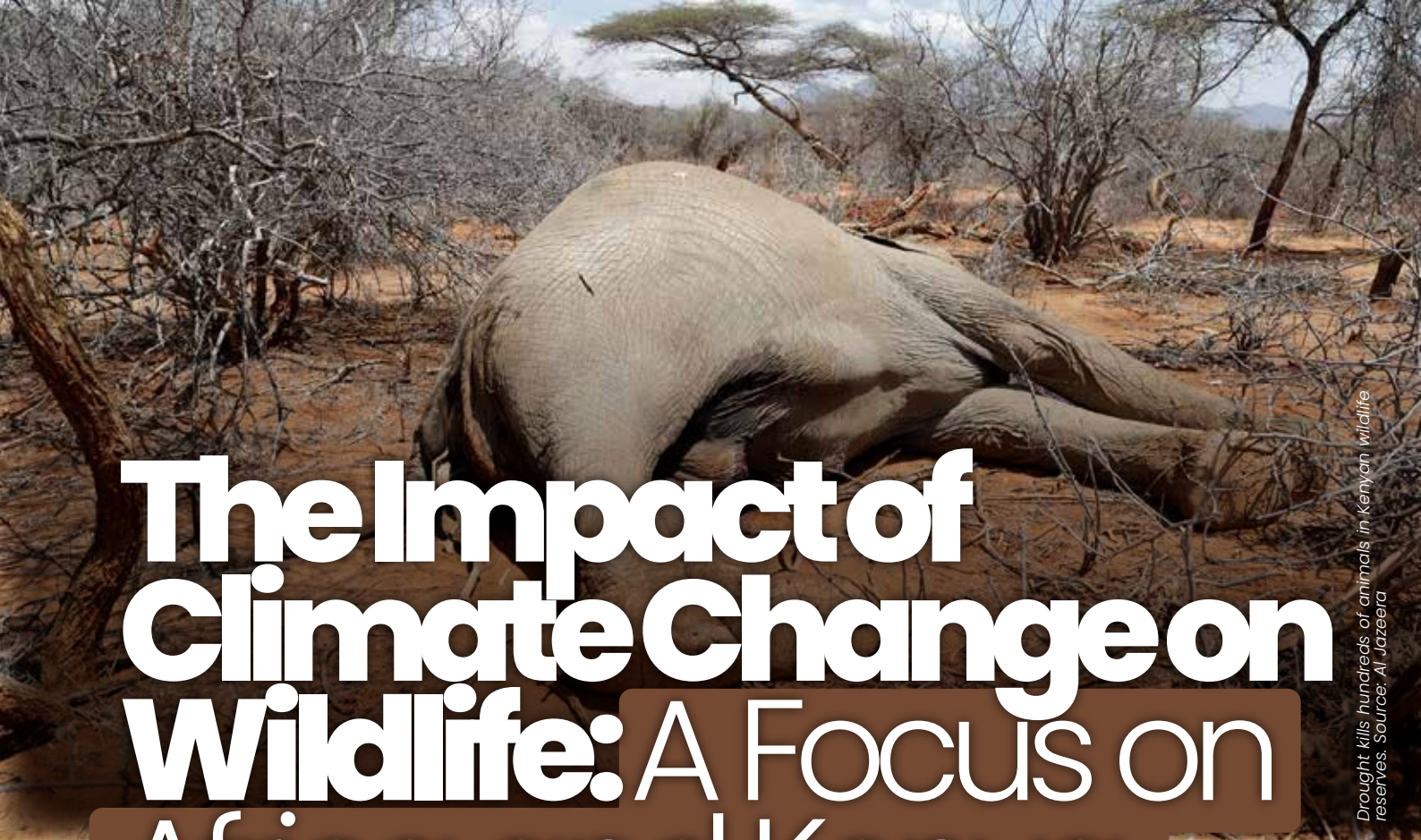
WASTE COLLECTORS' TOOLKIT

1st Edition 2023



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Drought kills hundreds of animals in Kenyan wildlife reserves. Source: Al Jazeera

The Impact of Climate Change on Wildlife: A Focus on Africa and Kenya

Climate change, sometimes called global warming, is like the Earth's fever. It happens because we do things that make the Earth warmer. This is mainly because people do things like driving cars, running factories, or keeping large number of livestock that produce gases that put extra heat into the air. This is drastically altering the planet's weather patterns and environment. These changes have profound effects on both animals and plants, endangering their habitats and food sources. Here we delve into the wide-ranging consequences of climate change on wildlife, focusing on its impact in Africa, with a special emphasis on Kenya.

Loss of Habitats

Climate change significantly contributes to the loss and transformation of animal habitats. The rising global temperatures, changes in precipitation patterns, and the increasing frequency of extreme weather events are rendering many areas unsuitable for various species, making them either too hot, too

dry, or too wet to inhabit. In Africa, this transformation is keenly felt, as diverse ecosystems are undergoing significant shifts due to climate change. For instance, the Sahara Desert is expanding southward, encroaching on previously fertile lands in countries such as Sudan and Mali. This expansion results in habitat loss for several species, including the critically endangered Saharan cheetah and desert elephants, which are increasingly losing their homes.

Kenya, a country renowned for its wildlife, is also grappling with habitat degradation due to climate change. The Maasai Mara ecosystem, famous for its rich biodiversity and the annual great wildebeest migration, is suffering from habitat loss. Prolonged droughts and irregular rainfall patterns have caused grasslands to wither, leading to food shortages for herbivores, including zebras and wildebeests. These animals primarily depend on grass, and when there is insufficient rain, the grass becomes scarce, affecting the animals' well-being and leading to lower reproductive success.

Migration Disruptions

Many species of wildlife engage in seasonal migrations to find food and water. These migrations are critical for their survival. However, climate change can disrupt these essential patterns. In Africa, some of the most extraordinary wildlife migrations occur, and they are particularly vulnerable to the impacts of climate change. The Serengeti-Mara ecosystem in East Africa hosts one of the world's most iconic wildlife migrations, with over two million herbivores traveling vast distances. However, as climate change leads to unpredictable and shifting rainfall patterns, the timing of this migration is being affected, which can result in food shortages, reproductive issues, and population declines.

Altered Reproductive Cycles

The timing of reproduction is critical for many animals, especially those in temperate regions. Climate change can disrupt these cycles by creating a mismatch between the timing of critical events, such as food availability, and the reproductive cycles of various species. This misalignment can result in reduced reproductive success and threaten the survival of certain species. In Kenya, white rhinoceroses are facing challenges due to unpredictable rainfall patterns. These rhinos need consistent rainfall to ensure adequate grazing for pregnant females and those lactating. Irregular rainfall can disrupt this pattern, leading to malnutrition and reduced reproductive success for the rhinos.

Increased Disease Transmission

Climate change contributes to the spread of diseases that affect wildlife. Warmer temperatures and altered

precipitation patterns create conditions favorable for disease-causing pathogens like parasites and viruses to thrive. The consequences are often devastating, particularly in wildlife populations. A notable case in Kenya is the outbreak of anthrax. Climatic changes have made the conditions suitable for anthrax bacteria to grow. This has resulted in significant mortality among herbivores, including elephants and buffalo, with cascading effects on the ecosystem.

Threats to Endangered Species

The cumulative effects of habitat loss, disrupted migration patterns, altered reproductive cycles, and increased disease transmission are pushing many African species, especially in Kenya, to the brink of extinction. The International Union for Conservation of Nature (IUCN) Red List highlights several endangered species across the continent, with climate change recognized as a significant driver of their declines. In Kenya, the reticulated giraffe, a subspecies of the northern giraffe, is facing a serious risk of extinction. These giraffes primarily rely on acacia trees for food, but erratic rainfall patterns are causing these trees to disappear, making it difficult for giraffes to find suitable food sources.



Ruins of the Tana River Lodge, which has been gradually washed away. Source: Caroline Chebet.

Changing Oceans and African Coastlines

Although Africa is predominantly a landmass, its extensive coastlines are not immune to the impacts

of climate change. Ocean acidification, caused by the absorption of excess carbon dioxide from the atmosphere, is a global issue that threatens marine ecosystems, and African coastlines are affected, too. For example, off the coast of Kenya, coral reefs in places like the Malindi-Watamu Marine Reserve and Kisite-Mpunguti Marine National Park are experiencing bleaching events and coral degradation due to rising sea temperatures and ocean acidification. These reefs are critical for marine biodiversity and support local fishing industries, making their decline a matter of ecological and economic concern.



Water hyacinth in Lake Victoria.

Range Shifts and Invasive Species

As temperatures rise and habitats change, some African wildlife species are attempting to adapt by shifting their ranges. While some may succeed in finding new areas to inhabit, others may face difficulties, leading to localized extinctions. Furthermore, the influx of invasive species that thrive in the altered conditions can outcompete native species, further disrupting ecosystems.

In Kenya, the South American water hyacinth serves as an example of how invasive species can disrupt local ecosystems. This plant, introduced to Kenya, has spread in Lake Victoria, outcompeting native aquatic vegetation. This invasion has negatively impacted local fish populations and the livelihoods of fishing communities.

Conclusion

Climate change is a multifaceted and severe threat to wildlife, affecting species across the globe in various ways. In Africa, especially in Kenya, these impacts are keenly felt as animals and plants struggle to adapt to the changing conditions. The culmination of habitat loss, disrupted migration patterns, altered reproductive cycles, and increased disease transmission is pushing many African species to the brink of extinction. The urgency

of addressing climate change for the sake of the entire planet, its ecosystems, and its inhabitants is evident in the context of Africa. To mitigate these effects, global cooperation and immediate action are essential. This includes reducing greenhouse gas emissions, protecting and restoring critical habitats, and promoting sustainable land and water management practices. Furthermore, it is crucial to support research and conservation efforts

aimed at safeguarding vulnerable species and ecosystems, both in Africa and worldwide. As we confront the challenges of climate change, it is important to recognize that the well-being of humanity is intrinsically linked to the health of our planet's ecosystems and the survival of its diverse wildlife. Protecting and preserving these species is not only an ethical imperative but a practical one, as our own survival is intertwined with the web of life on Earth. Africa, with its unique and vulnerable biodiversity, serves as a poignant reminder of the urgency to address climate change for the benefit of all life on our planet.

Dr Benson Okita-Ouma
Director of Wyss Academy for Nature, East Africa Hub, Co-Chair
of the IUCN SSC African Elephant Specialist Group

JUSTDIGGIT:

COOLING DOWN THE PLANET, TOGETHER

A woman in traditional Maasai attire, including a purple skirt and a red and white striped shawl, is using a long wooden digging stick to work the soil in a dry, open landscape. The background shows a vast, flat plain under a blue sky with scattered clouds. The woman is smiling and looking down at her work.

Imagine sub-Saharan African lands in 2030; lush, rich and cool. Imagine millions of subsistence farmers restoring their degraded lands through the implementation of proven Sustainable Land Management techniques. Can you imagine the enormous effect this will have on crop yields, household income, biodiversity, water availability, the regional climate and ultimately climate change? And that this could be done, not by moving slowly from one area to the next on the ground, but by motivating everyone together in one interconnected, international movement? One that unites INGOs, governments, scientists and companies, and one that connects a farmer in Senegal with another in Tanzania?

Meserani Bunds Monduli, Arusha Tanzania

We are in a global climate crisis: our planet is warming up while the human population continues to grow. All over the world, climate change, land degradation and over-exploitation are causing temperatures to rise, land to dry up and fertile soils to erode. The land degradation, often caused by unsustainable land use practices, urbanisation, and deforestation, has resulted in the decline of the land's quality and productivity. This, in turn, affects water availability, agriculture, and ecosystems. Land degradation and climate change create a ripple effect that touches every corner of our planet. As land deteriorates, its ability to absorb carbon dioxide diminishes, increasing the concentration of greenhouse gases in the atmosphere.

solution. If we bring back nature on a large enough scale, we can positively impact climate change. Globally, over 2 billion hectares of degraded forests and lands can be restored, an area twice the size of Europe!

At Justdiggitt we believe that if we can warm up the planet, we can cool it down too. But we have to take action now. We play our part by regreening dry and degraded African lands, together with farmers, pastoralists and local partners. Large-scale application of nature-based solutions will provide a better and more productive living environment for subsistence farmers and contribute to the uptake of CO₂ by biomass, making it (in addition to reducing



Women digging bunds in Emurua Bunds Monduli, Arusha Tanzania.

This causes serious problems, such as extreme droughts and famine. Every year, the world loses 12 million hectares of productive land, with far-reaching consequences, including failing crop yields, rising tensions over national resources, forced migration and weakened resilience to climate change. Vulnerable communities are hit the hardest, as environmental and social impacts are deeply interconnected, amplifying the urgency of addressing these challenges hand-in-hand. Thankfully, there is a

emissions) a key solution to the climate problem. Because the greener it gets, the cooler it becomes.

We use different low-cost, easily adaptable interventions, depending on the area and the terrain, to regreen. Kisiki Hai, a Farmer/Pastoralist Managed Natural Regeneration (FMNR) method, is an effective way to regenerate trees. It involves the selection, pruning and protection of stumps

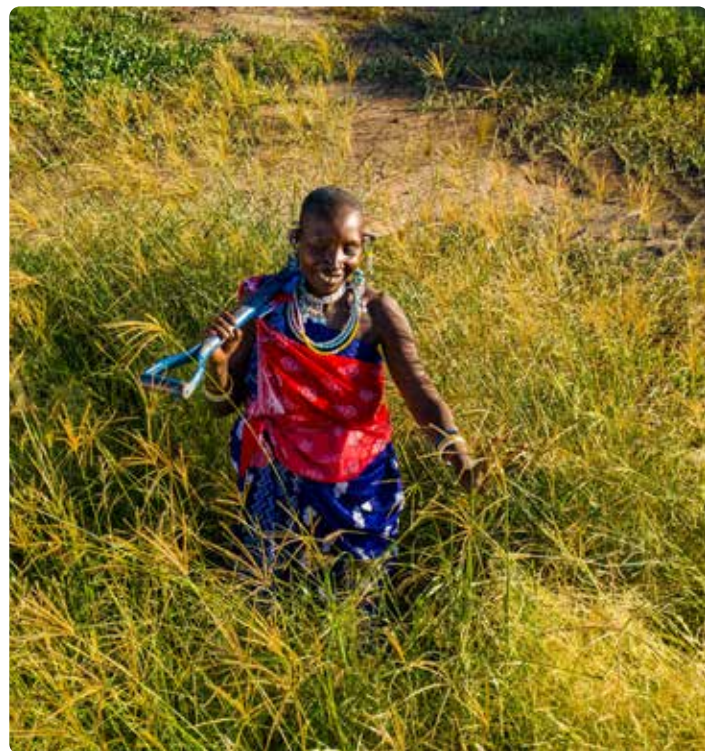
of cut-down (but alive!) trees. Another efficient, greening technique that we use is the digging of water-bunds: these semi-circular shallow holes, or earth-smiles as we like to call them, are dug in the ground to capture rainwater and prevent erosion. They promote infiltration, allowing seeds to grow into vegetation and giving soil a chance to restore. We have currently dug 315,000 bunds that are all ready to capture rainwater and transform large areas of land.



Emurua Bunds Monduli, Arusha Tanzania.

Besides close collaboration with community members and leaders about the exact location and borders of the bund plots, Justdiggit involves community members in the digging work. Not only does this create additional income for the diggers, it also increases ownership over the projects, which is essential for the continuation and preservation of the interventions. To date more than 2500 diggers have been involved in the construction of waterbunds.

Other interventions we use are water trenches, grazing management and grass seed banks. The latter are



Womai inspecting grass seeds at Esilalei Bunds Monduli in Arusha Tanzania.

managed by Maasai women's groups, who grow, harvest, and sell the grass seeds on local markets or to greening projects. Justdiggit, for example, uses the grass seeds to reseed degraded lands, such as our bund plots. The proceeds benefit the women and help improve their household incomes.

Justdiggit is active in Northern Tanzania, Central Tanzania and Chyulu, South Rift, and Amboseli in Kenya. In 2022, the total area under restoration increased by 18% to almost **400,000 hectares**. This figure includes all rangelands and farmlands where we are actively greening. That is the equivalent of 530,000 football fields next to each other or 2,5 times the size of Zanzibar's main island. With our Kisiki Hai projects, run together with LEAD Foundation, we have managed to bring back **14 million trees** in Tanzania. The majority of these trees are in the Dodoma region. We are also bringing back trees in the Singida, Arusha and Manyara regions. On top of that, the total water volume captured through our interventions is estimated to be over **3,750,000,000 litres** in 2022. That is almost enough to give every person on earth 0.5 litres of water!

In every new village we work, we train several well-respected and highly skilled farmers and pastoralists, to become 'champion farmers'. We always maintain a 50/50 balance between men and women. By completing the training, they become ambassadors of greening that help inspire and train other farmers in the community to get started. Last year, we trained 379 new farmers in our project areas in Central and Northern Tanzania. This means we are now close to 2000 champion farmers in total. This is vital for the development of a grassroots greening movement, as each farmer will activate about 110 new farmers.

Landscape restoration not only fights land degradation, but also has a substantial impact on climate change. Because reforested areas act as carbon sinks, absorbing the atmospheric carbon dioxide and slowing down its buildup. Moreover, improved soil health enhances water retention and agricultural productivity, reducing the vulnerability of communities to climate-related disruptions. And rejuvenated ecosystems provide habitats for diverse plant and animal species, fostering biodiversity and ecosystem resilience.

We are convinced that nature-based solutions play an important role in addressing the most important challenge of our time: cooling down the planet to mitigate the worst effects of climate change. That is why we are not planning to stop scaling our greening efforts any time soon! To extend our impact beyond our programs, we are boosting land restoration projects of other organisations in Madagascar, Ethiopia and Togo. We are also developing a new mobile platform that will enable millions of farmers to regreen their land, without the need for physical presence on the ground.



Our ultimate goal is to inspire and enable 350 million subsistence farmers and pastoralists in sub-Saharan Africa to regreen their own land by 2030! By combining indigenous landscape restoration techniques with the power of media and communication, data, and mobile technology, we can spread our message and scale up our greening practices. We want to inspire, unite and empower an entire generation, and grow a grassroots landscape restoration movement.

So let's dig in, together.

THYSA BEEKMAN
Communications Coordinator Africa
JUSTDIGIT



Conceptual photography on the impact of air pollution on human health