The Association of Commonwealth Universities

Commonwealth Futures Climate Research Cohort

Nature Based Solutions for Coastal Adaptation:

A comparison between Nigeria and Scotland

Final Report

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Executive Summary

Scotland has an unprecedented opportunity to lead the way and deliver Nature-Based-Solutions (NbS) to the climate crisis. Scotland's marine and coastal landscapes are facing numerous pressures from anthropogenic climate change. Similarly, in Nigeria, sea level rise, increased precipitation and storms, and warmer ocean temperatures provide similar threats. Therefore, in order to keep coastal communities in both countries safe from the pressures of climate change, adaptation is needed and NbS can provide suitable (and in some cases, better) alternatives to traditional engineering methods. However, the local impact of climate change and the potential of NbS is not always understood at the local or community level, with high-level science being misunderstood when presented to the public. This research to action project offers an insight into local Nigerian communities and their current situation as part of a focus group discussion as well as a social media package in form of an infographic which can be used to raise awareness in such coastal communities and show that first of all, they are not alone, and that there are solutions to the challenges they are facing.

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1. INTRODUCTION

1.1. Background / Context

Scotland has an unprecedented opportunity to lead the way and deliver Nature-Based-Solutions (NbS) to the climate crisis. Scotland's marine and coastal landscapes are facing numerous pressures from anthropogenic climate change including coastal erosion, rising sea levels leading to flooding and loss of marine ecosystems important for carbon sequestration (NatureScot, 2020). Not only will these changes impact ecosystem functioning, but they will have a significant impact on the many communities who live and work along Scotland's coasts (Liski et al. 2019). Similarly, in Nigeria, sea level rise, increased precipitation and storms, and warmer ocean temperatures provide similar threats. Coastal erosion is notable among other forms of environmental degradation that endangers human settlements (Chukwu, 2015; Danladi et al. 2017; Abija et al. 2020).

1.2. Need for Research-to-Action

Adaptation to changes in the coastal regions is key. Yet, the impact is not always understood at the local or community level, with high-level science being misunderstood when presented to the public (Seddon et al. 2020b). Therefore, it is important that a multidisciplinary approach is implemented, including both the involvement of decision makers and other stakeholders in the assessment process, alongside a clear statement of the implications for human wellbeing and effective communication to local communities. There are knowledge gaps and uncertainties which hamper the more widespread use of NbS (Stafford et al. 2021). These knowledge gaps are a barrier to developing the full potential of NbS for climate, nature, and people across both Scotland and Nigeria (NatureScot, 2020; Omokhafe et al. 2020).

In order to keep coastal communities in both countries safe from the pressures of climate change, adaptation is needed and NbS can provide suitable (and in some cases, better) alternatives to traditional engineering methods. For example, it is observed that grey/hard infrastructure increases vulnerability rather than address the problems. Alternative approach through nature-based solutions is recommended. One of the goals of COP26 is to promote the adaptation and restoration of natural habitats to protect communities. NbS go beyond finding a solution for just one problem, but can work on many issues at once, providing ecological benefits as well as socio-economic co-benefits and trade-offs (Dick et al. 2019; Seddon et al. 2020a).

1.3. Objective(s) of the R2A Project

The main objective of this project is to highlight the importance of nature-based solutions (NbS) to challenges caused by climate change. Furthermore, we would like to use case studies from Nigeria and Scotland to show that such different countries share common challenges and open the doors to future collaborations between these countries by informing on nature-based solutions. Successfully communicating these common challenges to different types of stakeholders in both countries is crucial for the success of this R2A project.

2. METHODOLOGY / APPROACH

In order to complete the goals of this research to action project, the group set up a plan which started with a literature review. Two groups, representing Scotland and Nigeria, were formed to not only learn about nature-based solutions in general, but to also start focusing on these two countries and their involvements when it comes to tackling coastal challenges due to climate change.

To further the understanding, a focus group discussion in Nigeria was organized, to also deepen the knowledge of the current situation. Having the opportunity to speak to people who are directly dealing with coastal communities in Nigeria in their day-to-day life helps identify the core issues in these communities and to solve the problems at their roots.

A problem, that was identified already at the very beginning of this project, was the importance of creating more awareness around nature-based solutions, since many people living in coastal areas and who are already facing the consequences of climate change at their doorstep, do not know that there are solutions to those challenges and that they can be nature-based and therefore do not cause more harm to the environment. In collaboration with a professional graphic designer, the group helped design an infographic which illustrates the common ground between Nigeria and Scotland. The entirety of the infographic can be split into different parts, that can be easily shared via social media or printed out as posters or flyers (on recyclable paper) to be directly shared in communities, with community leaders, and other stakeholders.

3. FINDINGS / UNDERSTANDING THE LANDSCAPE

In this chapter, all data and information collected through different methods are summarised.

3.1. Literature Review

3.1.1. Climate Vulnerability

Scotland has an unprecedented opportunity to lead the way and deliver Nature-Based-Solutions (NbS) to the climate crisis. Scotland's marine and coastal landscapes are facing numerous pressures from anthropogenic climate change including coastal erosion, rising sea levels leading to flooding and loss of marine ecosystems important for carbon sequestration (NatureScot, 2020). Not only will these changes impact ecosystem functioning, but they will have a significant impact on the many communities who live and work along Scotland's coasts (Liski et al. 2019). Similarly, in Nigeria, sea level rise, increased precipitation and storms, and warmer ocean temperatures provide similar threats. Coastal erosion is notable among other forms of environmental degradation that endangers human settlements (Chukwu, 2015; Danladi et al. 2017; Abija et al. 2020). Adaptation to these changes is key. Yet, the impact is not always understood at the local or community level, with high-level science being misunderstood when presented to the public (Seddon et al. 2020b).

3.1.2. How Can We Link Climate Vulnerability to Climate Change?

The IPCC (2013) defines vulnerability in the context of climate change as the 'propensity or predisposition to be adversely affected'. Climate change impacts can often be framed through exposure to natural hazards i.e., how likely is a country or community to experience extreme events such as hurricanes or flooding. However, high exposure does not automatically mean high vulnerability.

3.1.3. What Are the Different Options to Reduce Vulnerability?

In order to keep coastal communities in both countries safe from the pressures of climate change, adaptation is needed and NbS can provide suitable (and in some cases, better) alternatives to traditional engineering methods. For example, it is observed that grey/hard infrastructure increases vulnerability rather than addresss the problems. Alternative approach through nature-based solutions is recommended.

a) Current Situation in Nigeria

Nigeria, like many parts of the world, is experiencing climate change. The combination of frequent natural disasters, large population, poor infrastructure and low resilience to economic shocks, makes Nigeria especially vulnerable to climatic risks. This is in addition to high incidence of poverty, reliance of the poor on agriculture and natural resources (Cervigni and Valentini 2013). The 2019 Climate Risk Index published by the

Germanwatch Organization classifies Nigeria as a region of high risk and one of the topmost vulnerable countries. According to the revised national Policy on climate change, most vulnerable areas are coastal regions in the extreme southern part with erosion-prone areas in the south-eastern parts. The most vulnerable groups include farmers, fisher folks, the elderly, women, children, persons with disabilities, and poor people (NCC, 2021).

Low-lying areas along the coasts in Nigeria are at the risk of flooding and erosion. This is a notable challenge in the cities and rural settings. Human settlement and economic activities along the shoreline are increasing vulnerability in the urbanising areas. In the rural areas, decimation of mangrove ecosystems is a significant challenge. To address this, mangrove restoration/remediation initiatives in the coastal environment includes forest recovery. In this situation, nursery or actual seedlings are transported to polluted sites for tree growth (Numbere, 2021).

b) Current Situation in Scotland

Coastal areas are characterised by dynamic environments, where changes across the physical landscape are constant (Gomez et al. 2014). The scale of these changes can be quite large. Scotland's coastlines are dominated by both hard rocky coast and areas of mixed sediments, which can be largely quite resilient to coastal erosion (Hansom et al. 2017). However, extensive areas of coast, particularly along the east coast, are dominated by 'soft shoreline' (beaches and dune), which are facing increasing pressures from intensive coastal erosion. These disturbances can result from both natural occurrences, such as extreme storm events (Fitton et al. 2018) and anthropogenic through increased pressures from engineering developments (Burak et al. 2004). The 2017 UK Climate Change Risk Assessment (UK-CCRA-2017) indicated the growing potential for coastal erosion along Scottish coastlines, with approximately 11% of dwellings (~272,000), 25% of roads (~10, 700 km) and 14% of railway (420 km) being situated with 500 m of high-risk coastlines. Given that many coastal areas of Scotland support communities, infrastructure, and local/regional and large-scale industries, it is important that we can utilise the role of nature-based solutions to climate change to help inform assessments of coastal hazards and provide proactive planning (Scottish Government, 2014; Fittons et al. 2018).

3.1.4. Define Different Categories of Nature Base Solution

Scotland is currently utilising the vast opportunities for nature-based solutions across a number of different ecosystems and landscapes (NatureScot, 2021). These include harnessing the power of land and soil for increased carbon sequestration, ensuring the protection, conservation and management of marine landscapes and to improve urban environments to provide not only key solutions to enhanced climate change impacts but to also provide co-benefits for health, well-being, and socio-economic issues. The Peatland ACTION is a project led by NatureScot to help restore damaged peatlands across Scotland, in support of Scotland's Climate Change Plan Outcomes. Peatlands are one of the most

important carbon stores globally, storing more carbon that all other vegetation types combined (Loisel et al. 2021). However, they are increasingly becoming degraded, disturbed and destroyed. This project aims to restore over 25,000 ha of peatlands across Scotland, providing a clear nature-based solution to the climate crisis, but also improving biodiversity and well-being (NatureScot, 2021). As sea level rises and extreme storm events become more frequent, it is important that coastal areas are protected. Providing low-cost flood protection schemes using nature-based solutions such as conserving coastal wetlands, provides key benefits not only for the physical protection of the coastlines, but also another opportunity to provide key carbon sequestration potential.

In Nigeria, nature-based approaches to addressing climate and environmental issues are not entirely new. Things like Afforestation Programme have been implemented, including reforestation of degraded forest reserves/landscapes, land reclamation for flood control. Establishment of Great Green Wall Initiative for the Sahel region with promotion of dryland agricultural technologies have taken place. As NbS becomes popular globally, it is being advocated for in national policies, programmes and projects oriented towards climate adaptation. Revision of Nigeria's NDCs incorporates 'analysis of nature-based solutions for those sectors with significant and mitigation co-benefits' (Abubakar, 2021).

In addition, mangrove restoration initiatives are proposed for the Niger Delta Region in Nigeria where coastal communities have continuously suffered erosion-related problems (Whyte, 2021). These initiatives are not only seeking to enhance adaptation and mitigation potentials, but to clean up the coastal environment degraded through oil exploitation, housing development and depleted through uncontrolled consumption of mangrove-based resources.

3.1.5. What Are the Challenges, Opportunities or Effectiveness of Nature-Based-Solutions?

There are several challenges associated with the utilisation and effectiveness of NbS, especially in low-income countries (e.g., Nigeria) than in developed countries like Scotland. These challenges include the burgeoning population of urban centres, environmental stressors, government policies, human-nature relationships, and challenges associated with remediating and restoring the environment following anthropogenic or natural disturbances (Lechner et al., 2020). However, the advantages of utilising NbS for coastal adaptation far outweigh the risks and cost. This is because traditional engineering infrastructure which are commonly used for coastal protection and flood mitigation require high maintenance costs and oftentimes pose serious ecological implications (Temmerman et al., 2013). On the other hand, nature-based coastal protection and flood defence systems provide extra advantages, such as the recycling of nutrients, sequestering of carbon, production of fisheries and other aquatic foods, improvement of water quality, and the overall restoration of the marine coastal ecosystem.

3.2. Stakeholder Analysis and Engagement Framework

Climate change is a multi-actor context. Reviewing adaptation planning process across three countries in the global South, Anguelovski et al (2014) argue that engagement with stakeholders lead to better understanding, ownership, and strengthening of adaptation programs. Actors with stakes on climate change within coastal areas will ideally be from within governmental organisations, NGOs, local community organisations and representatives, private sector etc. Successful adaptation through Nature-based Solutions cannot leave out any actor at their various levels, hence the need to engage stakeholders as we attempted on this project.

3.3. Interview Results / Stakeholder Consultation Outcomes (if applicable)

In Nigeria, five stakeholders drawn from government agencies (Ondo State Ministry of Environment; Nigeria Erosion and Watershed Management Project), Non-Governmental Organization (FutureSavers) and Independent Experts were invited to a virtual focus group discussion. These stakeholders were selected because their job responsibilities are significantly within the domain of coastal settings. A virtual platform was used given that the stakeholders and researchers are based in different locations within and outside Nigeria. Only one of the invited stakeholders showed up for the focus group discussion which was held on 28th October 2021 via Zoom meeting to talk about nature-based solutions for coastal adaptation in Nigeria. The full report of this discussion can be found in the Annex under Sec. 9.1.

3.3.1. Participants

Mr Oluwaseyi Akinwumi Olowu – Representative of non-governmental organization based in Nigeria

Mr John Oluwatosin Atofarati - Transcript

3.3.2. Main Reflections

a) Creating Community Parks

Futuresavers.org is a non-governmental organization (NGO) based in Nigeria, with presence in 15-16 states and an office in Lagos. Their hallmark is climate education, which means, that they go to schools to teach young people and to raise young climate leaders. Furthermore, they support the concept of green spaces in Nigeria. They define community parks as spaces where there is a minimum of 20 to 30 trees. This organization plant both ornamental and economic trees in communities and schools respectively. It believes this will help to remove carbon emissions and as well improve livelihood. Mr. Olowu states that

in Nigeria air pollution is the second-highest cause of death, and that 60% of people who died of air pollution in Nigeria are children. Building community parks, green spaces in communities and schools will also help improve aesthetics, provide shade, and protect biodiversity.

During the discussion, it is pointed out, that this NGO, does not only want to create new parks, but also tries to revive dying parks. In Lagos for example, there used to be a lot of small parks or probably small gardens in the city, which are no longer in existence.

Mr. Olowu points out, that originally a lot of spaces in Lagos were allocated for parks and green spaces. However, these spaces have been sold for real estate or other profitable projects. In other words, the government is prioritizing finance over nature, and projects involving nature and green spaces are being lost in the Ministry's bureaucracy. It is further pointed out, that high-ranking people who have the political weight will put the interest of the environment above other things, and they would not be stopped by bureaucracy. So, in order to push projects involving nature-based solutions forward, the attention of people with political weight needs to be gained.

b) Possible Plan for Creation of Community Parks

First a suitable location needs to be identified where one can then engage the community. Such a location could be a piece of land that is designated for a park but has not been developed in whichever community. One could then raise a design for the park, which then will be presented to the community (Landlords meeting). Funds could be raised - even if not from the community alone - from other means. A start could be made by just planting trees on a Saturday morning by volunteers. And then one could go forward by installing swing set which could be a donation. Such a design could then be scaled up and replicated in other communities.

c) Nature-Based Solutions (NbS)

For the discussion around NbS a video was first shown (https://www.youtube.com/watch?v=C_MCp-Iu2Fw), which summarizes how to work with nature to tackle the climate crises, especially when it comes to mangroves, which provide a protective natural barrier and solutions against strong storms, floods and erosion. According to Mr. Olowu the Nigerian government has neglected mangroves in the coastal areas of Nigeria, where a large part of the population is residing and is already affected by the results of climate change. He also explains that the people in the town of Port Harcourt at the Niger Delta are suffering from the consequences of enormous destruction of the ocean in terms of oil spillage since they depend on clean water for survival. In Mr. Olowu's opinion the government is doing little to nothing to protect these coastal areas, especially when it comes to policy implementation. Following an awareness study that FutureSavers conducted, residents of the Port Harcourt area were describing the water as black and

unusable not only for humans but especially for the biodiversity. Besides local oil spills, another pollution source is the city of Lagos, which is the highest populated area of the country.

A major challenge, that was addressed during the discussion, is the challenge of mainstreaming NbS. Mr. Olowu identifies two challenges that are currently hindering the promotion of NbS: 1) Lack of education and 2) Lack of collaboration. He believes that people in the coastal regions are not well educated in terms of what they can do to protect their own habitat. Although those people are living with the problem, they do not have the skills, knowledge or awareness, that such NbS exist. Furthermore, these communities need to be supported by private companies, organizations, private bodies, and religious bodies to help them solve the local problems. To underline his statement, Mr. Olowu gives an example: "…the last time in Lagos at Oniru beach, we were there to clean the beach with my co-volunteers and my organization during the world clean-up day. The first thing we did was to sensitize the community for them to understand that there is a nature-based solution that they can adopt. A barricade they can make to stop plastic from entering the rivers. They can use bamboo as barricades to stop plastics. Because by observing, you will realize that plastic pollution is the major problem they are facing in that area of Lagos. I believe that's one of the nature-based solutions they can use, using bamboo." Mr. Olowu has observed that in recent years, NGOs might have been active in such coastal areas by cleaning beaches, but this does not prevent the beaches from being polluted again and it does not prevent plastic waste ending up in the oceans. It is important to include the communities, local businesses, and companies in such activism and train them to continue taking care of their environment.

A further point, which is being made, is that some people argue, that NbS will affect the beauty of the beach or that beaches would not be readily accessible and that therefore tourism would be negatively impacted. Mr. Olowu argues, that first of all, that we should prioritize nature over tourism. Moreover, he highly doubts that the current state of polluted beaches and dried-up rivers is a tourism-magnet.

An issue, that plays into conservation or restoration of Nigerian ecosystems, whether they are beaches or mangroves, is financing. Currently, Mr. Olowu's organization heavily relies on volunteers who gather for such events as "Global clean-up day". There is little to no funding in place which would support companies, organizations or individuals in implementing NbS. Additionally, the financial benefit of such NbS is not communicated to companies, which is why few are investing time into even considering such solutions. It would be ideals to come up with a plan to involve companies, which represent the big-polluters to show them how they can profit more from NbS than from continued destruction of the environment in which they operate.

4. SYNTHESIS OF THE FINDINGS

The main objective of this research to action project is to raise awareness around using NbS for coastal adaptation due to climate change. However, the importance of NbS and their role as a mitigation strategy is not often clear to many (having only recently become a common part of climate change discourse), especially the communities which are impacted directly by a changing climate.

In order to make these important concepts accessible to a wider demographic, especially those outside the research fields, we created an infographic (Figure 1). This was created in collaboration with Dr Nuria Melisa Morales Garcia, a graphic designer based in the UK. From this, we also created 3 easily shared posts that could be used on a variety of social media platforms (Figure 2-4). The infographic illustrates in an easy to digest format, the importance of NbS and why they would be of interest to both Scotland and Nigeria.

Since both Scotland and Nigeria have coastal wetland ecosystems (salt marsh and mangrove forest respectively), we focused this infographic on highlighting these important landscapes. Although distinct ecosystems, they both serve similar roles in reducing the vulnerability of coastal ecosystems from erosion through buffering wave action for example. Furthermore, both ecosystems are incredibly important carbon stores, but are being lost at an unprecedented rate globally through land-use change and disturbance.

As stated, the goal of this infographic was to share on social media. Dr Davidson initially shared the infographic and subsequent posts via Twitter and gained >12,000 impressions and > 200 engagements, including 15 retweets. Subsequent posting from the graphic designer increased this reach with more retweets. We were also able to reach Alison Barrett, the Global Programme Director for the British Council, who subsequently shared it with her colleagues at the British Council in Scotland (@BCScotland) and the British Council in Nigeria (@ngBritish). Finally, this work has also been shared within the University of Plymouth's new Nature-based Solutions Research Interest Group, co-created by Dr Davidson.

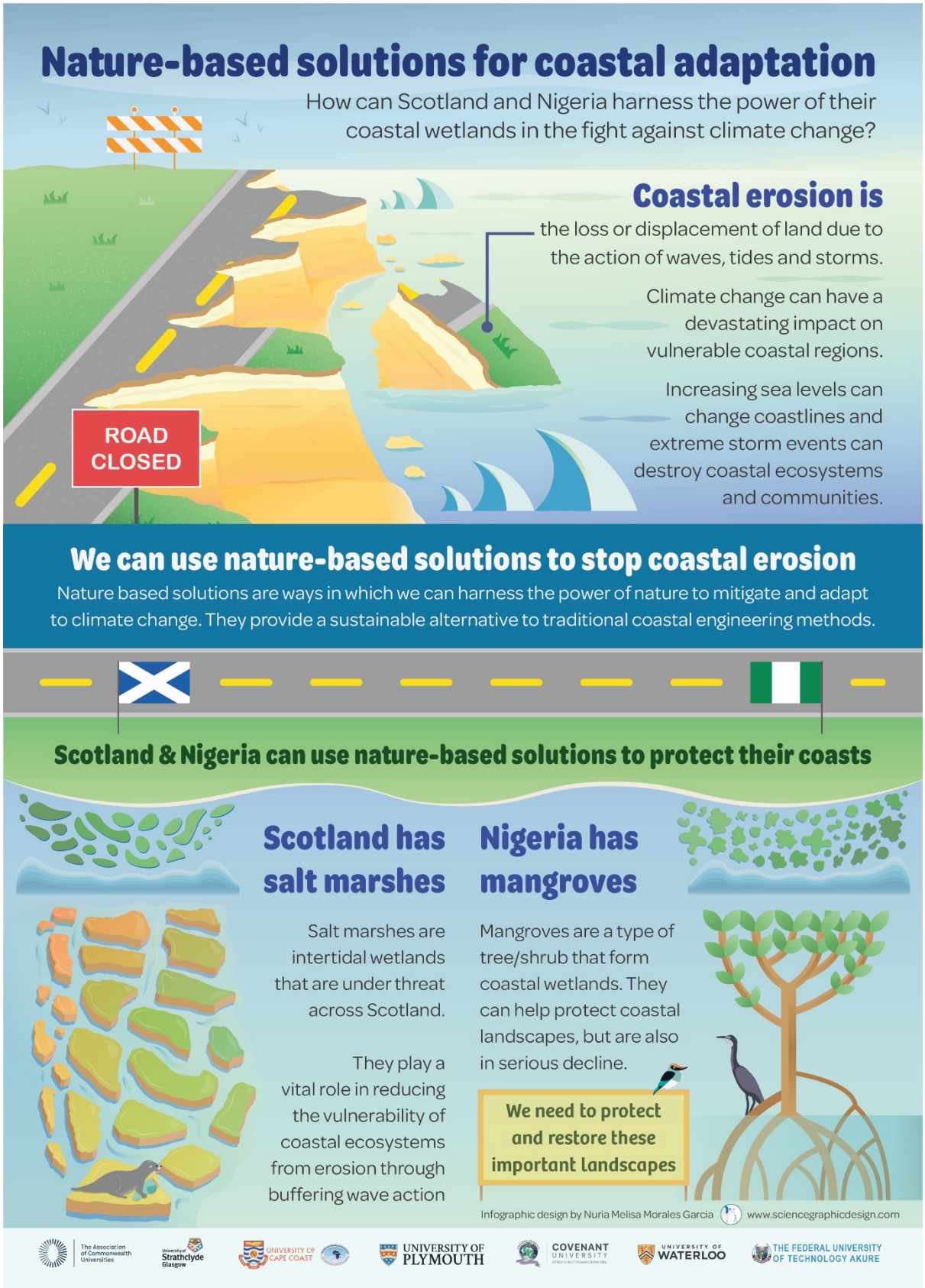

Figure 1: Full Infographic indicating the role of coastal ecosystems as a nature-based solution to coastal erosion and other climatic changes.

Figure 2: Social media ready graphic on nature-based solutions for coastal adaptation.

Figure 3: Social media ready graphic on stopping coastal erosion with nature-based solutions.

Figure 4: Social media ready graphic showcasing the different types of wetlands in Scotland and Nigeria.

5. RECOMMENDATIONS

In order to achieve maximum impact, the following actions are required:

1. Create appropriate public knowledge, awareness, and sensitization in order to provide public support for coastal policies.
2. Focus investment in nature and ecosystem-based adaptation and mitigation actions that enhance coastal protection and generate multiple co-benefits to people.
3. Strengthen the interface between ocean science and policy. Scientific evidence is vital to inform policymakers, drive action, and design solutions.
4. Adopt a multidisciplinary approach to better understand the impacts of climate change on the ocean and advancing solutions.
5. Involve countries, who have had major success implementing NbS.

6. CONCLUSION

Coastal ecosystems are already vulnerable under the pressures of climate change, as are the communities that depend on them. However, ocean ecosystems can also provide multiple benefits when managed well.

Therefore, nature-based solutions can be used to protect and restore this vital ecosystem, while also addressing climate change.

This work already represents a step in the right direction to raise more awareness in the impacted communities who are currently dealing with the consequences of climate change. Nevertheless, there is still much work needed, relationships need to be built, trust gained, and more conversations need to take place.

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