

Mangrove Vulnerability to Climate Change

Insights from Climate Crowd interviews

Climate Crowd is a crowdsourcing initiative that convenes and supports a network of partners to gather data on how climate change is impacting people and nature. The initiative supports on-the-ground projects that help rural communities adapt while reducing pressure on biodiversity.

Background

As the world grapples with how to respond to the worsening climate crisis, many have turned to mangroves as a solution to help curb the amount of carbon in the atmosphere and protect coastal communities from more frequent and severe storms, while protecting biodiversity and ecosystem services. However, climate change itself presents a significant threat to the world's mangroves. Using a keyword search, we identified 92 Climate Crowd interviews from eight countries that mention mangroves, and conducted analyses to learn how mangrove ecosystems are affected both directly and indirectly by climate change.

Storms and sea level rise

More frequent and severe storms, mentioned in 30% of the 92 interviews, can cause extensive damage to mangrove forests in a relatively short period of time. According to interviews, strong wind and wave activity have uprooted mangroves in coastal Cameroon and deposited large amounts of sand and silt, which has clogged mangrove channels. Storm surge is amplified by sea level rise, which research shows poses the greatest long term climate threat to mangroves.¹ In half of interviews, respondents reported rising sea levels, which contributes to greater coastal erosion and flooding (Figure 1). Through a process known as accretion, mangroves can produce and trap large amounts of organic matter and sediment, which can change the elevation at which thev grow, allowing them to adapt to sea level rise. However, this process itself may be limited by other climate stressors.²

Heat and changing rainfall

According to over half of the interviews, local people have experienced worsening drought or declining rainfall in recent years. Increased rainfall variability can slow root growth, which research suggests

Figure 1. Reported changes in weather & climate



Number of reports

60

can impair accretion.² Rising temperatures, noted in 48% of interviews, can also contribute to higher salinity through increased evaporation, which could reduce mangrove productivity and recruitment, and subsequently, accretion rates.¹ Climate Crowd interviews conducted in the town of Tela in Honduras indicate that a recent shift towards hotter, drier conditions has contributed to reduced freshwater flows, causing mangroves to dry out and die.

All told, one-third of interviews indicate mangrove mortality as a direct result of climate hazards including storms, sea level rise, rainfall variability and warming temperatures. The above section highlights how multiple climate hazards, when combined, can act synergistically to increase vulnerability. However, a potentially greater source of climate-related risk to mangroves is associated with changing human behavior in response to impacts of climate change on lives and livelihoods.



Relocation and rebuilding

A third of Climate Crowd interviews mentioning mangroves describe the conversion of mangrove forests to facilitate inland relocation of farms and settlements, which have been destroyed by rising seas combined with more frequent and intense storms. In addition to direct forest loss, this trend also exposes wildlife to increased poaching as noted in several interviews. In Cameroon, where coastal flooding has been particularly problematic, thirteen interview respondents noted a greater need for raw material to rebuild and raise homes and the subsequent toll on nearby mangrove forests. Such a phenomenon is not unique to Cameroon-after cyclone Jokwe hit Mozambique in 2008, purchasing of mangrove timber increased 14 times compared to the baseline predisaster rate.³

Changing livelihoods & resource use

According to the 92 interviews, climate hazards, including hotter temperatures and changing wind and rainfall patterns are greatly impacting farming and fishing, with two-thirds of respondents noting a change in fishing practices in response. Three respondents in Madagascar, for example, described how people have begun fishing in mangrove channels while using illegal gear to maximize catch. Impacts on main livelihoods have also prompted a shift to alternative livelihoods as noted by over half of those interviewed. Alternative livelihoods can often be resource intensive and involve encroachment on natural habitats, which has been observed by nearly three-quarters of respondents. Examples from the data include illegal hunting, logging and sand extraction. These findings align with other research showing that rural communities increase their reliance on natural ecosystems and the resources they provide (e.g. non-timber forest products) as a safety net during times of hardship.^{4.5}

Storms and sea level rise have also depleted natural resources including firewood and freshwater; over a quarter of respondents indicated that they had lost a water source. As one woman describes, because of sea level rise, people must travel farther for firewood and water, which leads to more encounters and conflicts with wildlife, including monkeys and wild cats.



Case study: Cameroon Mangrove extent: 2139.76 km2

Over a third of Climate Crowd interviews that mention mangroves were conducted in coastal Cameroon, where climate hazards have destroyed homes, livelihoods, and access to freshwater. According to one village leader, 10-15 homes are lost in a season, prompting many to rebuild and move inland at the expense of local mangrove forests. Changing rainfall patterns and salt water intrusion mean some now must travel 3km to the nearest water source. while others have begun harvesting rainwater. Purchasing of water collection containers and frequent rebuilding efforts require income, yet sources of income are scarce. Fifteen respondents mentioned loss of crops while 25 mentioned a decline in fish production. According to respondents. increasingly severe weather has driven away damaged boats, and created dangerous fish, conditions for fisherman. Logging and hunting have provided alternative income at the expense of mangrove ecosystems.

Figure 2. The below infographic represents the various pathways both direct (bottom arrow) and indirect (top arrows) by which mangroves in Cameroon are affected by climate change.









Loss of wildlife

Ecosystems may absorb and bounce back from sporadic and temporary periods of increased natural resource extraction. But as climate-related shocks and stressors intensify, more frequent and prolonged extraction of these resources may gradually erode ecosystems, and subsequently increase the long-term vulnerability of the communities that rely on them.

Recognizing the numerous benefits mangroves provide, one village in Cameroon has expressed interest in establishing a community mangrove forest to prevent further loss and degradation, and other respondents have observed local mangrove planting efforts. However, the long term success of these and other mangrove conservation projects will hinge on the adaptive capacity of both the mangroves themselves and the communities that depend on them. A Climate Crowd project in western Madagascar, for example, establishes beekeeping and seaweed

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farming as alternative livelihoods for farming and fishing communities living alongside mangroves. Such interventions not only generate income for local people, but also help to minimize pressure on mangroves associated with more destructive coping strategies employed in response to climate change.

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