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## **Drones as a Tool for Climate Change Mitigation and Adaptation**

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## Drones as a Tool for Climate Change Mitigation and Adaptation



by Brie O'Sullivan, PhD candidate Health Information Systems, Western University  
November 2, 2021

It was during a global health course in my master's studies that I first came across climate justice research. I'd heard the term before when reading about Greta Thunberg's protests seeking climate justice for younger generations, but not within the global health context. Upon further investigation, I remember being shocked to learn about the extent of climate inequities between the global North and South – and then being even more shocked that I hadn't considered this sooner.

One of the unfortunate truths of climate change is that its impacts are not experienced equally across the globe. The major contributors to global greenhouse gas emissions (most notably the USA, China, India, and Russia) often experience few negative consequences and are highly prepared to make climate-related adaptations. In comparison, low-income countries across the global South tend to bare the worst effects of climate change, despite minimal emissions, and are typically the least prepared when it comes to climate adaptations.

Climate change and climate injustices are an example of what we, in the global health field, refer to as wicked problems. Wicked problems are typically complex, messy webs of social, political, economic, and public health issues without a clear, one-size-fits-all solution. In addition, they frequently leave people (myself included) feeling frustrated and helpless. As an extension of my work and research experience on drone technology, I recently began thinking about how the use of drones in humanitarian action may be applied to climate adaptation and mitigation strategies in the global South.

Drones, often referred to as unmanned aerial vehicles, are a type of aircraft typically flown autonomously through computer programming, or remotely by a pilot. Over the last decade, drones have become more common as a tool within the humanitarian sector because they are

generally easy to use, very versatile, and tend to offer relatively cost-effective solutions. While technological innovation is certainly not always an appropriate solution to issues in low-resource settings, I was excited to see that drones are already being deployed for various climate-related purposes around the world. Even though technology will not single-handedly solve the climate crisis and its corresponding inequities, it gives me some hope to see progress being made at the local level in countries that have been hit especially hard by climate change. So, without further ado, here are three interesting ways that drones are being used by countries in the global South as tools for climate change mitigation and adaptation:

## 1. Tree-planting

One of the most fascinating applications of drones for climate change mitigation I've come across so far are tree-planting drones. Over the past few years, many conservation companies have appeared with the aim of using drones as a tool for reforestation. Some examples include AirSeed Technologies, Dendra, and recently, a start-up in Toronto called FlashForest. These companies use drones to fire seeds into the ground and then monitor the growth of saplings from above. This method is much more time-efficient than hand-planting trees and makes seeding in hard-to-reach areas significantly easier. As many people know, trees act as carbon sinks, absorbing carbon dioxide from the atmosphere and releasing oxygen in its place. For this reason, forests are often described as the Earth's lungs. However, deforestation rates are rapidly increasing across the globe as a result of rising populations, land development, and agricultural expansion.

For example, Madagascar, an island nation off the coast of East Africa, has lost 90% of its forest cover since human settlement approximately 2,000 years ago (Drone News, 2020). According to conservation biologists, this is a result of the country's rapid population growth, which is expected to rise from its current 26 million to 60 million by the year 2060, as well as climate-related impacts to local ecosystems. In July 2020, the Prime Minister of Madagascar announced their plans to purchase a fleet of 10 drones for reforestation purposes (Drone News, 2020). The government has an ambitious target to reclaim around 4 million hectares of previously deforested land by 2030, and they believe tree-planting drones may help them reach this goal. In the many coastal regions of the island, mangroves will be the major focus of reforestation efforts. Mangroves, a dense vegetation found along tropical coastlines, are known for their powerful carbon absorbing abilities and complex root systems that are essential for preventing coastal erosion and flooding. In other words, mangroves are an incredibly important variety of tree for mitigating climate change and preventing the degradation of land. However, due to the nature of the environments in which they thrive, mangroves are very difficult to replant by hand, making drones a promising reforestation solution (Drone News, 2020).

## 2. Insect Management

A less frequently discussed subject when it comes to climate change is the impact it has on global insect populations. Higher average temperatures tend to positively effect insect reproduction and allow insect populations to expand into new regions that were not previously habitable (CABI, 2020). This has led to a rise in agricultural pests, such as locusts and fruit flies, as well as mosquitos, which are a major transmitter of illnesses such as zika, dengue, and malaria throughout the global South. The versatility and precision of drones has made them an ideal option for dispersing pesticides to control insect populations.

Rising insect populations have especially negative consequences in regions such as East Africa, where the majority of people rely on local agriculture for income and food security. In recent years, many East African countries have faced devastating locust infestations, putting

approximately 25 million people at risk of food insecurity (CABI, 2020). Desert locusts are one of the most destructive agricultural pests, and climate-related changes, such as increased rainfall and warmer temperatures, have allowed them to breed rapidly and migrate to new areas. In 2020, the Centre for Agriculture and Bioscience International (CABI) partnered with Astral-Aerial, a Kenyan drone company, to launch a drone pesticide release project targeting desert locust populations within Kenya (CABI, 2020). CABI and their partners chose to employ drones for this project due to their ability to access hard-to-reach breeding sites better than ground-release methods, as well as their superior precision when compared to other aerial-release methods. So far, CABI reports that the project has been successful in reducing Kenyan locust populations with more updates soon to come (CABI, 2020).

### 3. Sustainable Agriculture

Similar to their use for pesticide release, drones are quickly being integrated into global agricultural systems as a method for sustainable farming. This is yet another example of how the versatility of drones make them an excellent tool for meeting diverse requirements. Globally, changes in temperature and weather patterns are creating many new challenges for farmers in terms of crop health and productivity. This has especially adverse outcomes in low-resource settings where access to farming necessities such as fertilizer, pesticides, and fresh water is already a major issue. Agricultural drones use high resolution imagery to identify specific crops that are in need of care, allowing farmers to apply the required resource only where it is necessary, thus reducing costs and waste. Furthermore, drones can be programmed to distribute resources quickly and precisely (Pix4D, 2020).

In Mexico, for example, a local company called CoatzaDrone was able to increase crop production on a large banana farm by approximately 30% annually. Using agriculture drones, farmers were able to identify and track areas that were over or under-watered, allowing them to save water by applying it only where required and, by extension, improve crop productivity (Pix4D, 2020).

Overall, the use of drones for tree-planting, insect management, and sustainable agriculture are just three of the many emerging technological innovations being used for climate change mitigation and adaptation throughout the global South. Will locally led interventions such as these help low-income countries increase their preparedness for climate-related changes in the coming years? While there is certainly potential, the most effective way to alleviate the inequitable burdens of climate change across the globe is for high-income countries in the global North to take accountability and reduce their contributions to greenhouse gas emissions. This is not unattainable, but will require collective action across multiple sectors and disciplines. Understanding potential climate change impacts and solutions from the perspective of my own industry (the drone industry) has helped me situate myself within this complicated and dynamic wicked problem. I highly recommend that my fellow emerging global health leaders do the same and share what you learn along the way!

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[madagascars-lost-forests/](#)

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### Bio

Brie is a PhD candidate at the University of Western Ontario studying medical delivery drones in low-resource settings. Alongside her studies, Brie works at an international non-profit called WeRobotics as a health robotics researcher, leading projects on a variety of topics related to the use of drones in humanitarian action.

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