Drone Usage in rural communities.

Drones are used in a myriad of ways with different missions, from military to commercial and increasingly for personal entertainment. Despite this, many people's prevailing impressions of drones are as dangerous tools used in warfare. However, drone technology is making a positive impact in communities most wouldn't expect, with an expanding presence in rural areas. Introducing this type of technology in rural areas has been met with differing responses, but both global and local organizations are developing relationships with small communities that are now using this technology to aid them in everyday life.

I want to pursue this project because of where I come from. Bhutan opened its doors to the outside world in 1974. It is a collective society with an emphasis on preserving its culture and environment. Though these have remained unchanged for hundreds of years, they are now challenged by globalization and modernity. I have witnessed my cousins, yak herders, migrate from the mountains to the cities for an easier life. Due to these changes, many Bhutanese people resist and even fear modernity, instead of embracing the assets it brings. I believe Bhutan, like the countries I will explore as a Watson Fellow, can one day benefit by the use of drone technology.

As a Watson Fellow, I will travel to rural areas in Tanzania, Brazil, and Japan where local technicians as well as non-profit organizations are engaging with rural communities to help them understand how drones can make a positive impact. I will learn how high tech people have incorporated drone use while forming relationships with local people so they embrace rather than push away this technology.

I will start my journey in Tanzania. Flying Lab, established by WeRobotics, are intentionally teaching drone technology to locals who will then decide how they should be used to address local issues. Leka Tingitana is the managing director of the Tanzania Flying Lab and has experience in “transferring technology from industrialized countries to areas with limited resources in a local context.” Yussuf Said, head pilot and trainer founded the Apps Club where students learn to develop mobile applications. In Dar es Salaam, I will work with these individuals to better understand ways their organization is making headway with rural communities. Their expertise in the area of UVAs is unrivaled in their region and they are imparting their knowledge of drones through workshops for teens and interested adults. WeRobotics’ efforts are didactic, with formal instruction at their core. They are taking early action and preparing the community for a technological future. They teach and train locals holistically from territorial mapping to imaging capacity, focusing on both the hardware and software components. This makes it possible for me to contribute to Flying Lab’s work in a concrete way. After speaking to We Robotics’ communications manager we’ve devised a potential opportunity where my coding and drone-building skills could add to their educational program, with me leading these workshops. While there, I hope to see what challenges present themselves in both getting the community to care and getting the information across.

Engaging with the drone-focused organizations started by individuals trained by Flying Labs, I will understand how they apply their knowledge of drone technology to the issues they’ve chosen and in what ways Flying Labs was most helpful to them. Drone Wings a startup gathers and processed data after the effects of natural disaster. The nuances of these undertakings is something valuable that I would also be learning first hand, how they test their drones for months before their use and the technical work involved in drone maintenance and reparation.

My work within their organization will be facilitated by my connection to FlyingLabs because they maintain a close connection to the organization.

In Rondônia, Brazil, drones are essential for the Karipuna community who sought the use of drones to combat illegal loggers. Hivos People Unlimited, a development aid organization, co-developed *All Eyes on the Amazon*. This project trains indigenous communities to use drone technology in combating the Amazon's deforestation. Like Bhutan, the Karipuna lived a life of relative isolation until the 1970s. However, Karipuna is now threatened by illegal logging. Though aware of the destruction, they had not been aware of its scale. Community leaders are using drone-shot videos to show the government irrefutable evidence of the scale of deforestation. They have even presented their case in front of the UN Permanent Forum on Indigenous People. During my time here, I will see how Hivos began their relationship with the Karipuna and how they got them to use drone imaging towards such a powerful end. I'm specifically intrigued to see the strategic use of drones for illegal logging because Bhutan faces a similar issue.

I have contacted the Latin America office of Hivos, Green Peace and Witness, members of *All Eyes on the Amazon* project about the possibility of working and learning alongside them in Karipuna. I'm still finding out if staying in the community is possible or if I have to commute from Porto Velho city, about 115 miles from the Karipuna Community. The new presidency in Brazil could prove to be a point of concern, the administration wants to open the Amazon to mining and this together with threats received from illegal loggers, may change the potency of the Karipunas efforts and even pose safety concerns. Therefore, I have contacted individuals who have experience navigating the area such as Oliver Salge who is the project leader of All eyes on Amazon and journalist Erickson-Davis from Mongabay, an online news publisher, about the possibility for me stay within the community.

Were my project with Karipuna to fall through due to safety reasons, the All Eyes on Amazon project is also working with communities in Ecuador. Specifically, it would be valuable to visit the Korfan Tribe given their recent court case victory against illegal gold mining companies with evidence gathered through drone imaging made possible by training. This area experiences fewer issues with illegal miners. Further, there is the alternative of SENAR-MT, National Rural Learning Service located in Mato Grosso that provides drone trainings to rural farmers. In 2016, they trained more than 180 rural producers, teaching them how to use drones to detect diseases in plants and irrigation channel issues. This use is applicable to communities around the world, so it would be interesting to see how this is carried out.

Japan will be my final destination due to optimal conditions to see drones in action during the sowing season. In Japan, drones are successfully transforming traditional methods while developing with current technology. In Tome, a rural area of northern Japan, drones are already assisting farmers by making farming less labor intensive and attract the younger generation to jobs. The presence of infrared camera on drones enable farmers to see unhealthy field areas and accordingly treat these with pesticides. It has improved the productivity and efficiency of farming especially in areas that have faced decades of falling birth and labor rates. A person sprays pesticides on one acre a day but drones have enabled farmers to spray 30 hectares in a day. I will not only learn how the drones are being put in use but more importantly, the process by which this new technology was introduced to farmers and how it has reached the current scale. Additionally, I will connect with the drone pilots at the tech companies Nileworks and Enroute who are working closely with local farmers to bring new technologies to the communities. Enroute has opened E.R.T.S. Togane School for safe operation of its drones. Japan is a case where the heights drone technology reached in agriculture is impressive, in fact commercial UAVs are becoming a lucrative business. Initially, this was a point of concern for me

because it seemed that the use of drones was already both commercial and independent but visiting Tome, E.R.T.S. Togane School in Chiba and local farmers, I would surely learn how this technology was first introduced and what it took to have it embraced so strongly.

While traveling to the countries I selected I do anticipate some challenges in communication and language barriers, however, I believe that because technology is universal and I am already acquainted with drone technology, cross-cultural collaborations with people from different backgrounds will be feasible and fruitful towards my goals for this project. With drone technology, a new gateway to agriculture and other environmental issues has opened. Though Bhutan is what inspires this project, what I learn during this experience will show me what it takes to move technology forward in rural areas as a whole. Although the implementation of drones for agriculture in their full capacity is unlikely to be immediate, just the introduction of these progressive approaches is vital for the future of farming and conservation in Bhutan and other developing areas. I know this technology can be applied in Bhutan and I will learn how by traveling to countries where the similar people are being integrated successfully.