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## **Implementation of drones in the protected areas of Mexico.**

As the entire world appears to relentlessly accelerate in every possible direction, many countries and organizations started to consider that going forward in time, without any changes will take human kind to places where it is impossible to have good quality of life and preserve the environment.

In 2015 more than 180 countries forming the United Nations reunited to create the UNDP or United Nations Development Programme, an agency designed to implement the Sustainable Development Goals. Said goals had the objective of secure the happiness, economic wellbeing, peace and prosperity of the people by 2030. In total there are 17 goals, focusing on key aspects of improvement like 'No Poverty', 'Zero Hunger', 'Clean Water and Sanitation', 'Clean Energy and Climate Action'. Some of the goals are more ambitious than others but all of them have in common that require imaginative projects to be reached. (*Sustainable Development Goals, 2121*)

As a branch of science, Engineering has the particularly difficult task to research and apply different concepts to enforce the Sustainable Development Goals; 'Climate Action' and 'Life on Land', in this particular case. Environmental security over many protected areas in Mexico has to be enforced with technology, particularly with the use of UAV or Drones.

According to the CONANP there are 182 Protected Areas in Mexico, adding to 32,200 hectares of protected field in the entire country not counting deep sea (*Comisión Nacional de Areas Naturales Protegidas*, 2121). In 2019 only 4,450 hectares were superintended and it took the combined effort of 2,814 people and 76 million pesos worth of budget. That would mean that the surface monitored is approximately 13.8 % of the entire Protected Surface (Logros Institucionales, 2019). Though the number appears small, the benefits of the surveillance have had a great impact on many endangered species like the jaguar, the conservation of many trees and the avoidance of devastating fires.

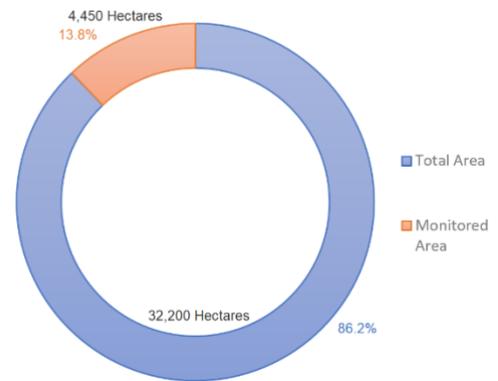


Figure 1. Monitored Area in 2019

Other countries with vast spaces of valuable field have been considering using UAVs as well, as a way to improve the range and visibility of human guards and firekeepers. For example, in Romania, illegal logging has been damaging a great portion of the forests for the last 30 years, made worse only by the lockdown caused by COVID-19. In this case, the trees and fauna of the area are not the only ones in danger, the foresters assigned to patrol the woods are lightly equipped as they have to sustain hours of travel and are trained just to call the police in the case of an incident, trying to avoid confrontation. (Burlacu and Ghioaldă, 2020)

Another example where the use of drones has already been implemented is the Peruvian Amazon. Since 2016, The Amazon Conservation Drone Program has been using two types of drones to map an enormous region called 'Madre de Dios' with the purpose of monitoring deforestation and illegal gold mining in an area very close to the border between Bolivia and Peru. The drones have been in charge of mapping the area periodically and identify possible threats to the forest. The area was divided into 3 priority areas, the smallest one being of 2470 acres or 1000 hectares, making them perfect for programmed drone vigilance. (Garcia et al, 2018)

Considering the Peruvian Amazon was equipped with the best technology, it is possible to survey around 1000 hectares of open field effectively. There are 23 Protected Areas in Mexico, the largest being 35,000 hectares and the smallest 10 (Logros Institucionales, 2019). Figure 2 shows all the sizes more clearly. 17 Areas are around 1000 hectares, so the majority could be completely patrolled. The rest would require much more work and perhaps drones could reach only certain parts, especially since the 3 largest include vast underwater areas.

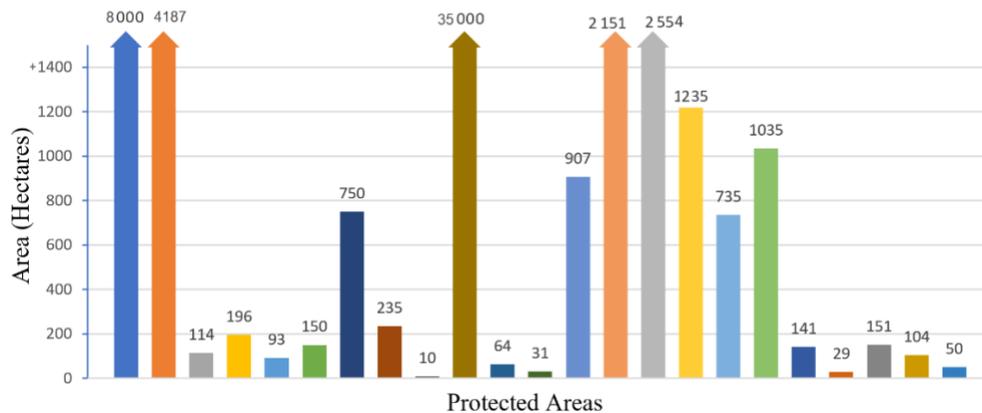


Figure 2. Area of every Protected zone in Mexico

The negative side of the heavy use of drones could be both the cost and the controversy generated by the use of UAVs in military warfare. That being said, as time goes forward and the use of drones expands to many aspects of life other than war, the drones have started to gain more acceptance. In a study realized in 2017 involving 1904 adult Americans, the idea of implementing drones for domestic use proved to be polarizing but, for a more industrial use and as an environmental protection tool the results were 81% positive (Markowitz et al, 2017). That leaves the problem of the cost. A possible option in Mexico could be finding businesses willing to endorse the projects, the same strategy used in the forest of Peru, a project funded by Google Challenge. (Garcia et al, 2018)

In conclusion, the use of drones has been used in many countries to patrol and map large and difficult to access areas, the same idea can be used to improve the protection of threatened zones by illegal logging, mining and hunting of endangered species of Mexico. The implementation of this technology is not as ambitious as it appears and as an Engineer the idea of helping the environment while interacting with drones is a delightful.

Finally, the implementation of this resources can be softened economically with the help of philanthropic businesses and civilians. The projects would probably be well received by the public, as the use of drones far from cities and for an environmental cause proves to be accepted by people. This would allow to maintain these resources for much longer so the future generations have the privilege of enjoying in the same world we lived in.

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