



ثانوية التكنولوجيا التطبيقية  
Applied Technology High School



# Aqua Drone

## Utilizing Drones to Clean Oceans from Plastic Waste

*Think clean, save the marine*

*Done By:*

*Fatima Abdulla Albreiki*

*Ayesha Mohamed Batoun*

*Reem Ahmed Saeed*

*Supervisor: Buthaina Ali Abandah*

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## Abstract

*In the beginning of the project we choose a topic which is plastic pollution. Because everything in this world we use comes from the ocean in some way. The air we breathe, the water we drink, even the products we use day to day, would not be possible without the ocean. That's why the issue of ocean pollution is so important and needs to be addressed as soon as possible. After that we came up with a set of questions to conduct a research before designing the prototype and these questions included the following: How many plastic bottles does a UAE resident use? Which countries pollute the oceans the most? What is the number and weight of plastic pieces floating at the sea? how does plastic the pollution affect marine life? In this project our aim is to design a prototype, and an application that aims to clean the beach, sea or ocean from different types of plastic that cause plastic pollution and harm to the coastal and sea life. We followed simple steps to build the prototype firstly we designed the sides on a website called On Shape then we printed each side using a 3d printer after that we attached the sides to each other along with the net finally we attached the drone to the box. As a result the Aqua Drone was able to float on water without causing any harm to the environment and the drone was able to eliminate some of the multi-million tons of plastic in our oceans and it can “eat” up to 3.5kg of trash in one trip. In conclusion we think that the Aqua drone was able to gobble up to 3.5kg of trash because the prototype is able to skim 15cm of the water's surface and can collect up to 3.5kg of waste at a time.*

## Research Questions

*How many plastic bottles does a UAE resident use?*

*Which countries pollute the oceans the most?*

*What is the number and weight of plastic pieces floating at the sea?*

*how does plastic the pollution affect marine life?*

## Introduction

*Everything in this world we use comes from the ocean in some way. The air we breathe, the water we drink, even the products we use day to day, would not be possible without the ocean. That's why the issue of ocean pollution is so important and needs to be addressed as soon as possible. We depend on the ocean for so much in our life, without it we would surely become extinct. People seem to think that since the ocean is so large and vast, we can dump as much waste as we'd like into it and it will never have an effect on us. In some areas of the world, seas have become so polluted that ecosystems are in danger. In this modern world, many human have understood the problem of sea and other water pollution. Some of these human are taking steps to clean up the polluted sea and these steps include:*

- *using fewer plastic products*
- *helping to take care of the beach*
- *being a sea-friendly pet owner*
- *Supporting organizations that work to protect the sea*

### 1. Aim

*In this project our aim is to design a prototype, and an application that aims to clean the beach, sea or ocean from different types of plastic that cause plastic pollution and harm to the coastal and sea life.*

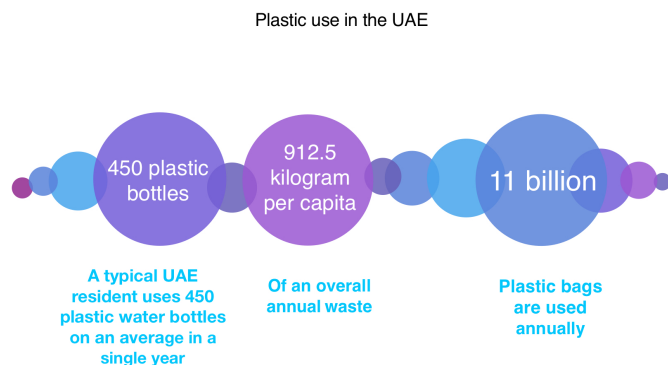
## 2. Hypothesis

*In this project we will test if the Aqua Drone is capable of cleaning the coastal and sea life from plastic pollution?*

## Research method

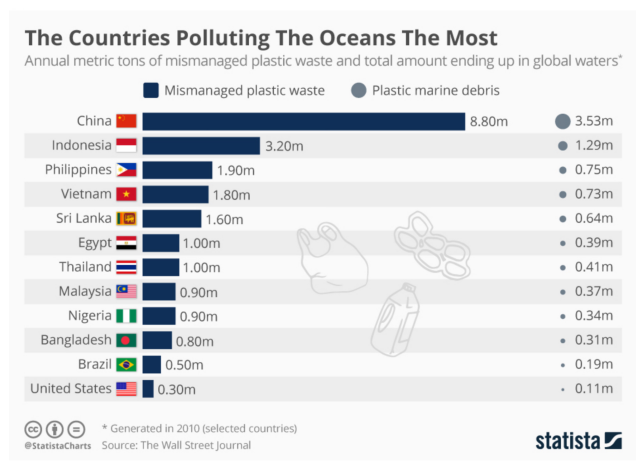
*Since the UAE is amongst the world's highest consumers of single-use plastic.*

*According to estimates, a single UAE resident can use around 450 plastic water bottles per year and less than 10% of the country's total plastic waste is currently recycled. That's why we came up with the idea of recycling plastic and reusing it to make new boxes using a 3D printer. According to statistics from UAE's Ministry of Environment and Water we found out that a whopping 11 billion plastic bags are used annually, and this goes on to add up to an annual overall waste of 912.5 kilogram per capita. These statistics reflect on the extent of use of plastic bags and bottles in UAE and the consequent generation of plastic waste. After that we took our researching area to a global level and we looked at the countries which pol-*



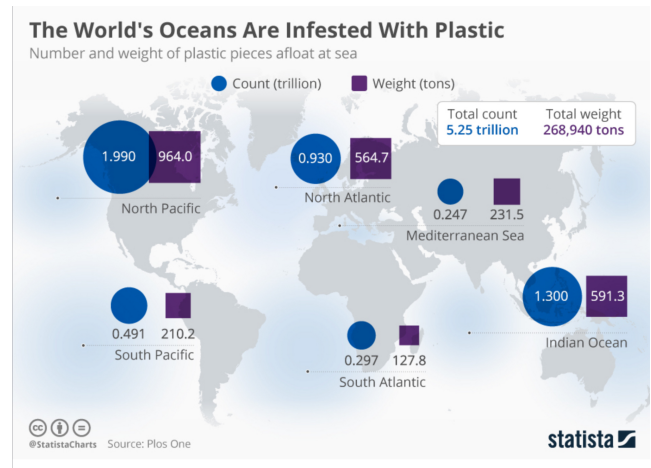
*lute the oceans the most so that we can provide the Aqua Drone in a worldwide scale.*

*In 2010, 8.8 million metric tons of mismanaged plastic waste came from China with an estimated 3.53 million metric tons of it ending up in the ocean. A total of 3.2 million metric tons of mismanaged plastic waste came from Indonesia and it is estimated that 1.29 million metric tons became plastic marine debris. We found out that China and Indonesia are the top sources of plastic bottles, bags and other rubbish clogging up global sea lanes. Together, both nations account for more than a third of plastic detritus in global waters.*



*We noticed that over the last decade we have become increasingly alarmed at the amount of plastic in our oceans. According to statista it's estimated that there are up to 5.25 trillion pieces of plastic weighing about 268,940 tons are floating at the sea.*

*If we continue to pollute at this rate, there will be more plastic than fish in the ocean by 2050.*



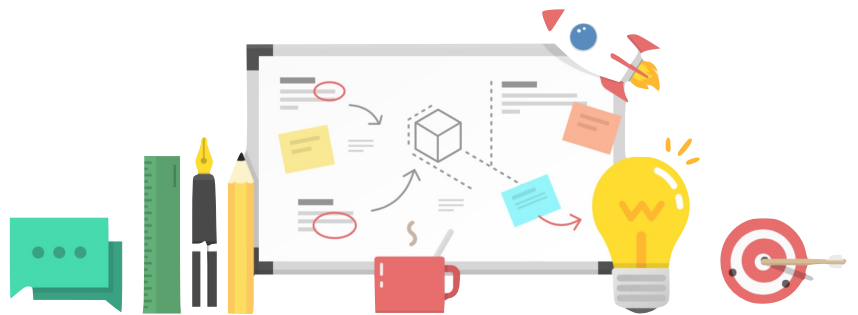
*We found out that plastic waste kills up to a million seabirds a year. As with sea turtles, when seabirds ingest plastic, it takes up room in their stomachs, sometimes causing starvation. Scientists estimate that 60 percent of all seabird species have eaten pieces of plastic, they predict that it will rise to 99 percent by 2050. That's why we made the Aqua Drone animals friendly because it sends waves to the animals to inform them to keep a distance from the Aqua Drone so that they don't get trapped in the net. In addition to that the Aqua Drone is ecosystem friendly because it's made up of recycled PLA,*



## Design Specification and Construction

### Idea

*Our project's idea is that we provide live stream cameras at specific location that have a high concentration of plastic. In addition when people see plastic pieces floating at the surface of the water they can contact us through our application where they can send pictures of the place and their location so we can send our drone to that location and the Aqua Drone will collect the plastic from the surface, but if there is plastic under the surface of the water the box will break apart from the drone and it will collect the all plastic that's found under the water. Once the the Aqua Drone is fully loaded with plastic its programmed to return back to the docking station where plastic will be unloaded and directed to recycling stations. Where the plastic will be reused to make new boxes using a 3D printer.*



### Materials

*Aqua drone is made up of simple and cheap components.*

#### 1. Drone



#### 3. Super glue



#### 2. Laundry net



#### 4. PLA plastic



## Procedure/Method

### Step 1

- *Gather all the material*

### Step 2

- *Assemble the drone*

### Step 3

- *Then design the box using a website called on shape*

### Step 4

- *Afterwards use a 3D printer using PLA plastic to print the sides of the box to reduce the weight*

### Step 5

- *Now glue the laundry net to the sides of the base using super glue*

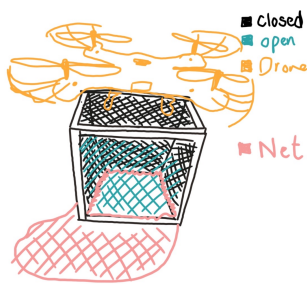
### Step 6

- *Then attach all sides together using a super glue*

### Step 7

- *Finally attach the drone to the box*

## Sketch



## Description of the parts

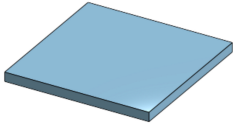
### Box

*Firstly we used PLA plastic to print all the sides of the box which is easily recycled, total weight of the box is 286 grams and it took 4 days to print all the sides.*

- **Top**

*The top is 15x15x1 cm it weights 65 g and it took 5h and 32min to be printed*

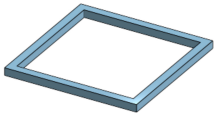
top



- **Front**

*The front is 17x17x1 cm it has a hole which is 15x15 cm it weights 30 g and it took 2h and 37min to be printed*

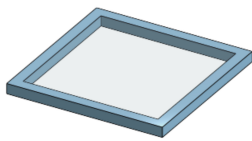
front



- **Base**

*The base is 15x15x1 cm it has a hole which is 13x13cm It weights 38 g and it took 7h 26min to be prInted*

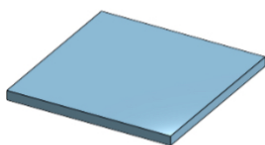
base



- **Back**

*The back is 17x17x1 cm and it weights 80 g it took 7h to be printed*

back

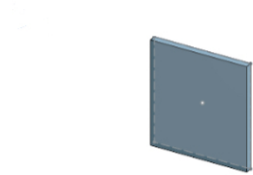




- Sides**

*Each side is 15x17x1 cm and it weights 73 g it took 6h 14min to be printed*

**sides**



## Drone

*6-axis gyro quadcopter*



## Cost

Materials	Cost in AED
1st drone	419
2nd drone	104
Batteries	15
Other materials	0 (they were available already)
Total cost	583

## Stages

Stage one was for a school project and this was our first prototype



Stage two was for the council judging level for the Nsti festival competition and this was our prototype



This is our 3rd stage and this is our final prototype



## Problems we faced

*We faced many difficulties and we got inspired by this quote to share our experience “Just because something doesn’t do what you planned it to do doesn’t mean it’s useless.” ~ Tomas Edison ( inventor ), While printing one of the sides we faced a difficulty and one of the sides was printed as 2D not a 3D as we wanted. After that problem we decided to reprint the side. Another problem we faced was that we ordered a drone online but it arrived later than we expected and the drone's size was unacceptable because it was much smaller than the box so we had to go out and buy another drone which can lift more weight and has a longer life time.*

## Future plans

*In the future we are planning to:*

- *Build a prototype that can gobble up to 25kg of plastic*
- *We are also planning to provide Aqua Drone on a world wide scale*
- *We are also planning to use 100% recyclable material, and definitely an Aqua Drone that uses 100% solar power*
- *We are working on providing a power supply that works 24/7*
- *We are planning to improve our app based on your feedback we will be adding more features*
- *Build a prototype that removes other pollution factors not only plastic*

## Results

*As a result the Aqua Drone was able to float on water without causing any harm to the environment and the drone was able to eliminate some of the multi-million tons of plastic in our oceans and it can “eat” up to 3.5kg of trash in one trip.*

## Result analysis

*In conclusion we think that the Aqua drone was able to gobble up to 3.5kg of trash because the prototype is able to skim 15cm of the water's surface and can collect up to 3.5kg of waste at a time. The Aqua Drone is ecosystem friendly because it's made up of recycled PLA, and it also has some sensors that make it animals friendly.*

## Conclusion

*This proves that the Aqua drone protects the sea life from plastic pollution that jeopardizes the natural ambience of the marine life. When the Aqua Drone is loaded with collected plastic the drone is programmed to return back to the docking station where the waste can be unloaded and directed to recycling stations. The Aqua Drone is ecosystem friendly because it has some sensors that makes it animals friendly.*

## Acknowledgements

*In performing our project, we had to take the help and guideline of some respected persons, who deserve our greatest gratitude. The completion of this project gives us much Pleasure. We would like to show our gratitude to **Mrs. Buthaina Ali Abandah, our physics teacher and our supervisor, also Mr. Rabah** giving us a good guideline for the project throughout numerous consultations. We would also like to expand our deepest gratitude to all those who have directly and indirectly guided us in this project.*

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