University of Applied Sciences and Arts Northwestern Switzerland
School of Engineering

SWISS STUDENT SUSTAINABILITY CHALLENGE

Exhibition-Nr. U24

Plastic Marine Pollution

How to Remove It from the Oceans

Current Situation

Plastics are an indispensable part of our daily lives. They are easy to process, elastic, durable and lightweight. But plastics are increasingly becoming a problem for people and the environment. Littering and improper waste management are the reasons why plastic waste ends up in nature.

Project Aim

This project aim is to identify and analyze already used or planned projects that address the challenge of the plastic problem in our oceans and to identify possible synergies.

To do so, the underlying basis of this research is to gain a deeper understanding of plastic marine pollution.

How does plastic get into the oceans? How can plastic particles be categorized? What are the environmental impacts of plastic? And what are the properties of plastic?

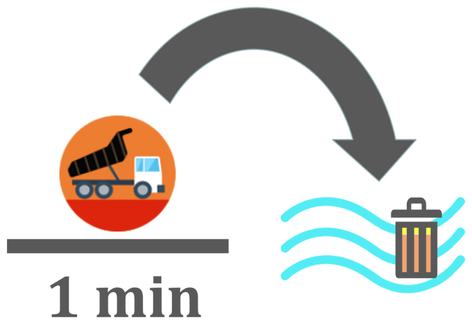
Methods of Research

- Literature research
- Written interviews with six ongoing projects
- SWOT analysis of the individual projects
- Evaluation of the projects with defined criteria

PROBLEMS

Plastics in the Ocean

Jambeck and his team calculated that in 2010, 275 million tons of plastic waste were generated in the coastal regions of 192 countries. Between 4.8 to 12.7 million tons of plastic waste were released into the sea, approximately, one truckload of plastic per minute.



95% of sea waste is made of plastic

Volume of Plastic

The largest of the five garbage patches is located in the North Pacific Ocean, weighing 80’000t (10’000 elephants) and is 38 times the size of Switzerland (Lebron et. Al. 2018).

North Pacific Garbage Patch

vs.

Switzerland

Environment

For humans, when consuming mussels or oysters, the probability of absorption of microplastic is highest. The animals filter the seawater and microplastic enters their stomach via their gills. Since seafood is in many cases consumed with its stomach contents, microplastic ultimately becomes a health risk for humans too (Janssen 2014).

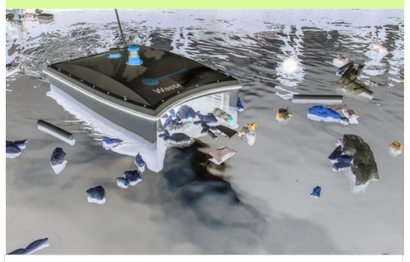
- Turtles, 100 % are affected (7 out of 7 species).
- Whales, 31 % are affected (25 out of 80 species).
- Sea lions, 67 % are affected (22 out of 30 species).
- Seabirds, 25 % are affected (103 out of 406 species).

ANALYZED SOLUTIONS

The Ocean Cleanup

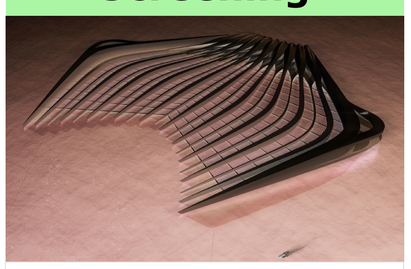
A passive system that uses the natural tides to fish plastic from the sea. The initial idea of young Dutchman Boyan Slat.

WasteShark®



A floating drone that is similar to the whale shark, and accordingly the name WasteShark®. With its mouth, the robot can collect plastic in harbors, lakes and rivers autonomously or remotely and bring it ashore.

Pacific Garbage Screening



Marcella Hansch's platform consists of various canal systems that look like a comb. The water flows through the chambers, is calmed down and plastic with a lower density than water can be skimmed off.

One Earth – One Ocean

The idea of One Earth – One Ocean a maritime garbage collection. Waste ships collect, process and recycle waste in coastal areas and estuaries of rivers.

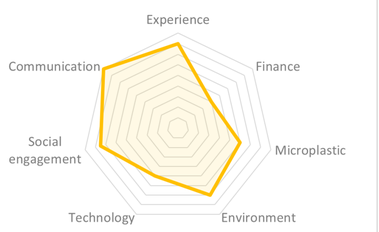
The Seacleaners

The Sea Cleaners is an association with Swiss skipper Yvan Bourgnon. The team wants to clean up the seas with a quadrimaran. Wind and solar energy supply the sailing ship during the garbage collection.

Seabin

Seabin is the garbage can for the ports of this world. Once installed, it collects garbage day and night and cleans the seas of plastic garbage.

EVALUATION



	The Ocean Cleanup	WasteShark®	Pacific Garbage Screening	One Earth – One Ocean	The Seacleaners	Seabin
Founded:	2013	2016	2016	2011	2017	2015
Phase:	Testing	Testing	Concept	Cleaning	Concept	Cleaning
Capture (24h):	430’000 kg	1’440 kg	unknown	20’000 kg	unknown	1,5 kg
Plastic Size:	> 10 mm	> 0,9 mm	> 5 mm	> 30 mm	> 5 mm	> 2 mm

Course of Study / Semester: BSc Energy and Environmental Technology FS19
Graduant: Rolf Stucki
Principal: Marina Hasler, Swiss Student Sustainability Challenge FHNW
Expert: Michael Brennwald
Lecturer: Prof. Dr. Oliver Bendel, oliver.bendel@fhnw.ch

SOURCES

www.fhnw.ch/technik