

Title:

Mapping the Plastic

Speaker:

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Chair FIG Working Group 4.3

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UTM
UNIVERSITI TEKNOLOGI MALAYSIA





Mapping the Plastic

Addressing the alarming problem of
plastic pollution of our waterways

A surveyor's perspective

Simon Ironside

Chair FIG Working Group 4.3



Plastic clogs up a waterway in Yangon, Myanmar.

courtesy of Global New Light of Myanmar, 5 June 2018

Plastic Pollution Overview (Waterways)

The Commonwealth Scientific and Industrial Research Organisation, Australia (CSIRO)



How much waste enters our oceans?

Objective

We are using field sampling to measure and mathematical modelling to estimate the distribution and movement of plastic waste near urban centers, along waterways, on the coast and in the ocean.

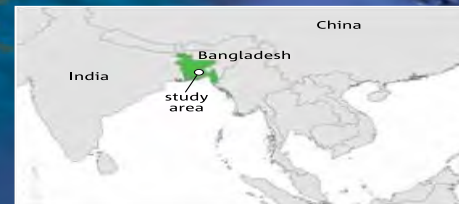
Outputs

We are designing robust sampling plans tailored for each country involved. These plans can be adapted for other participating countries.

These data will comprise a comprehensive dataset of plastics on land, along rivers, at the coastal interface, and in the ocean for major coastal cities around the world.

We will use these data with statistical models to produce maps that highlight the plumes of plastic emerging from urban centres and nearby areas.

We will then estimate the amount of plastic from the plumes that is lost to the open ocean or redeposited back to land.



Chandpur, Bangladesh, one of our study sites.



We are developing a world-first empirical baseline estimate of mismanaged waste entering the marine environment. Results will be publicly available through visual products to increase awareness, inspire change, and transform the global conversation around plastic usage and its environmental impacts.

Top 10 river systems contributing to ocean plastic

- Yangtze River, Yellow Sea, Asia
- Indus River, Arabian Sea, Asia
- Yellow River (Huang He), Yellow Sea, Asia
- Hai River, Yellow Sea, Asia
- Nile, Mediterranean Sea, Africa
- Meghna/Bramaputra/Ganges, Bay of Bengal, Asia
- Pearl River (Zhujiang), South China Sea/East Sea, Asia
- Amur River (Heilong Jiang), Sea of Okhotsk, Asia
- Niger River, Gulf of Guinea, Africa
- Mekong River, South China Sea/East Sea, Asia

***Export of plastic debris by rivers into the sea** - Authors: Christian Schmidt, Tobias Krauth, Stephan Wagner,

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Export of plastic debris by rivers into the sea -

Authors: Christian Schmidt, Tobias Krauth, Stephan Wagner

- While ocean plastic remains a daunting problem, this could be good news for the quest to control it.
- These 10 waterways contribute between 88 and 95 percent of the total plastic load that oceans receive via rivers and would be good places to focus on better waste management.
- The high fraction of a few river catchments contributing the vast majority of the total load implies that potential mitigation measures would be highly efficient when applied in the high-load rivers
- Reducing plastic loads by 50 percent in the 10 top-ranked rivers, would reduce the total river-based load to the sea by 45 percent.

Mapping the Plastic – FIG Working Group 4.3

A joint initiative of
FIG Young Surveyors Network
FIG Commission 4 (Hydrography)



2019 Leadership Group

- Chair Simon Ironside
- Vice Chair Melissa Harrington
- Gordana Jakovljević - University of Banja Luka (Bosnia and Herzegovina)
- Prof. Miro Govedarica - University of Novi Sad (Serbia)

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Stopping the use of waterways as a convenient waste disposal system is crucial

The lack of a means to analyse the spatial and temporal extent and quantum of plastic waste at a site specific, regional or global level and tools for ongoing monitoring represents a significant obstacle to eradicating the plastic pollution problem.

Understanding the quantum and frequency of plastic waste passing through a river/waterway system before it reaches the open ocean is essential to combating the problem

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Much of the available information on the scale of the plastic pollution problem is based on relatively crude modelling

Mapping the Plastic brings together scientific, surveying, spatial & engineering skills and expertise to accurately determine the amount and type of plastic litter in our waterways

Mapping the Plastic will provide accurate data at specific locations to better inform land use control

Research

Global research indicates that remote sensing data from satellites and airborne platforms available in different spatial, spectral and temporal resolutions has the potential to be a reliable source of long-term qualitative and quantitative information over large geographical areas.

We are using remote sensing data to distinguish plastic in surface water from surrounding litter/debris classes.

Research

Assessment of the spatial extent and variability of plastic is possible due to the unique spectral signature of polymers in the near-infrared section of the electromagnetic spectrum.

Data acquisition technology and identification methodology has been developed enabling the identification of plastic debris as small as 1 cm²

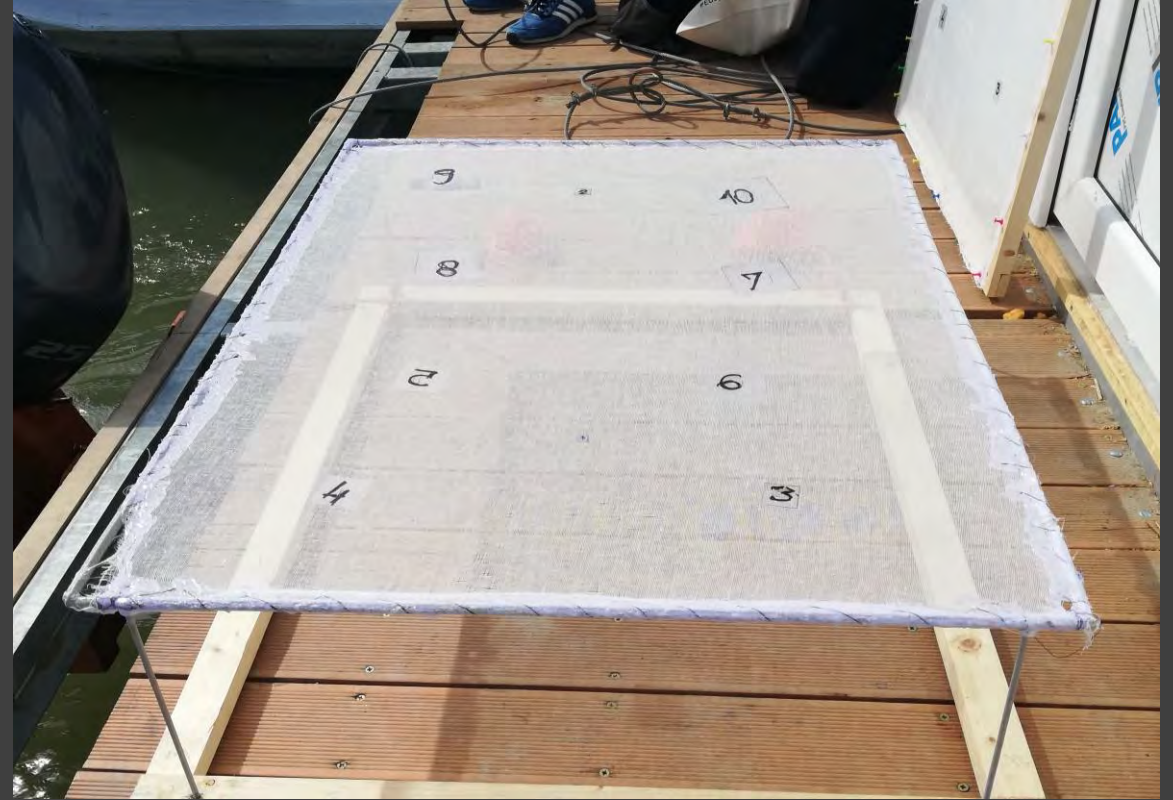
Developed algorithms for plastic detection based on RGB & MS images are described in the paper *Remote sensing data at mapping plastic at surface water bodies*, presented at 2019 FIG Working Week in Hanoi.

Research

Our initial research was based on WorldView 2 satellite images of plastic debris in the Drina River in Serbia

Additional surveys have subsequently been undertaken using a WingtraOne drone with RGB (42MP) and MS cameras identifying markers with predefined plastic sizes

These surveys have been undertaken with the drone flown at different heights with varying camera resolutions and the results are very promising



River Drina plastics survey

thanks to the University of Novi Sad (Serbia) and the University of Banja Luka (Bosnia and Herzegovina)

Survey Methodology

High resolution satellite and drone data has been processed using the developed algorithms to detect floating plastic in surface water.

Combined with 'ground truthing' land surveying measurements, bathymetric depth data, and water current data, this information will enable our teams of volunteers to accurately map plastic concentrations at global 'hot spots'.

The survey results will enable regulators to more fully understand the extent of the phenomenon they are facing and inform decision-making to address the problem(s).

Our Volunteers

Our principal volunteer base is the FIG Young Surveyors Network, with their interconnecting networks in each of the 120 FIG Member Associations, including members of Persatuan Juruukur Tanah Bertauliah Malaysia (PEJUTA) in Malaysia.

However, youth is not necessarily a pre-requisite and we are seeking volunteers of all ages with a strong sense of social responsibility, commitment and adventure; surveying and spatial expertise would be an advantage!

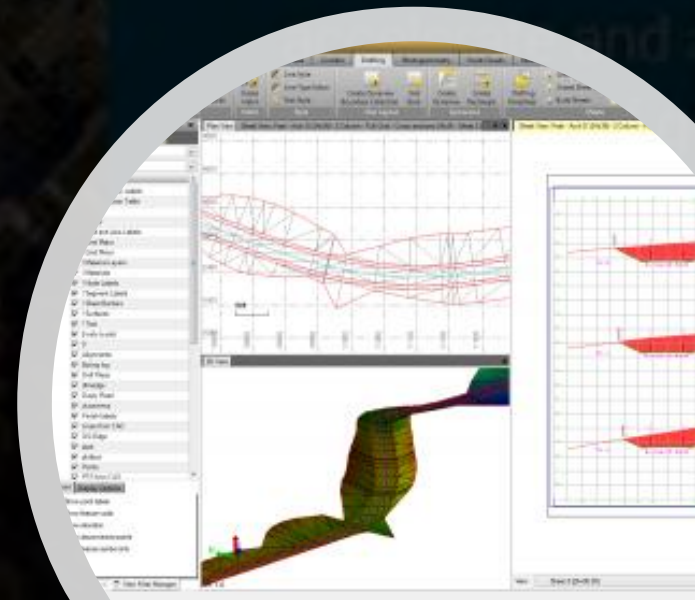
Our Volunteers

The YSN is coordinating the Mapping the Plastic training programme through their networks including at the 2020 FIG Working Week to be held in Amsterdam, the Netherlands next May.

For those wishing to volunteer for this demanding but satisfying work please contact YSN Chair Melissa Harrington – melissa_harrington@trimble.com

Thank you Trimble!

- R10 GNSS receivers
- Greenseeker crop sensor
- Trimble Business Centre
- eCognition software



Wish List!

- WingtraOne VTOL drone system with
- L1/L2 PPK GNSS receiver
- Sony RX1RII 42MP camera
- RedEdge MS Camera
- Pix4D Mapper

Currently investigating the means to purchase!



Networks and Alliances

FIG

Commonwealth Clean Ocean Alliance

Trimble

CSIRO

GreenHub

Aotearoa Plastic Pollution Alliance

Plastic Whale

The Ocean Cleanup

Algalita South Pacific

Sustainable Coastlines

OpenOceans Global

Commonwealth Clean Ocean Alliance

Potential Survey Hotspot locations



Mekong Delta – in conjunction
with GreenHub/Government of
the Socialist Republic of Vietnam



Africa – various locations



Pacific Island Nations –
Polynesia/Micronesia

Where to from here?

Ensure a sustainable income stream to enable us to be part of the solution

Continue our ground-breaking research

Strengthen relationships with everybody!

Understand the stresses and strains of plastic pollution at regional, national and local levels

Offer assistance to government and non-government organisations

Raise awareness by publicising our work

What can we do to assist in Malaysia? – please let me know

Upcoming Mapping the Plastic Events

Mapping the Plastic Workshop in Wellington on 8 December - S+SNZ, APPA, LINZ, NIWA, PM's Chief Science Advisor

Plastics Mapathon at 2020 FIG Working Week Amsterdam, May 2020 ,

Plastic waste survey in Amsterdam during the 2020 WW, raising awareness and training, bedding in of data processing and deliverables

Mapping the Plastic technical session at the 2020 WW

Mapping the Plastic

Thank you for your
attention

Are there any questions?