B PLASTIC ODYSSEY





Plastic-Less Society

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Webinar

24/06/2020 11:00 CEST

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WELCOME TO THE WEBINAR!

Before we start...

- Due to the number of attendees, please keep your microphones muted at all times and switch off the webcam function
- You can use the conversation function anytime to submit your questions. They will be addressed during the Q&A at the end of the webinar

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AGENDA

- ESA Welcome and introduction
- Bernhard Bauske (WWF)
- Bob Vrignaud (Plastic Odyssey)
- ESA Invitation to Tender: how to apply
- Open Questions & Answers session



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THE EUROPEAN SPACE AGENCY

Purpose of ESA

To provide for and promote, for exclusively peaceful purposes, cooperation among European states in space research and technology and their space applications.

Facts and figures

- Over 50 years of experience
- 22 Member States
- 8 sites across Europe and a spaceport in French Guiana
- Over 80 satellites designed, tested and operated in flight

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space transportation

earth observation



telecommunications and applications human spaceflight



navigation

exploration









PLASTIC-LESS SOCIETY ESA's Planned feasibility study







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Dr. Bernhard Bauske

Senior Advisor Marine Litter Reduction Programme WWF – Germany



Monitoring of plastic pollution using satellite images

> 24. June 2020 ESA Webinar Dr. Bernhard Bauske WWF Germany



The WWF in short



+ 6.200

WWF has over 6.000 employees throughout the world

+ 5.000.000

WWF has over 5 million supporters

Photo: © NASA

WWF is active in

+ 100

over 100 countries spanning across 5 continents

1961

WWF was founded in 1961







WWF No Plastic in Nature Initiative

1. Business Model Innovation	2. Global Plastics Policy	3. PlasticSmart Cities
 Bilateral & Sectoral Corporate Engagement Global platform on plastics (ReSource) Entrepreneurship and innovation Extended Producer Responsibility 	 Advocacy for a global policy solution to halt plastic emissions Create international legally binding instrument and agreement to target plastic pollution (including Extended Producer Responsibility schemes) 	 Addressing major leakage points at city level Piloting in high polluting sites in South East Asia Ambition to start a global movement
Global Plastics Campaign Cross cutting support to all work-streams		



Examples from our work in countries of SE – Asia: Waste management action plans for cities and regions





A global problem needs a global solution

A new international legally binding agreement





National targets to prevent, control and remove marine plastic pollution.

Global architecture to coordinate, report and review.

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Intergovernmental panel of experts and harmonized measurement and monitoring



Global standards and regulations on high risk materials and disposal methods



Implementation support mechanism. *I.e., finance, technology, capacity building.*



Monitoring: Guidelines of GESAMP

Guidelines for several methods of monitoring for marine litter:

- Sea shorelines
- Sea surface
- Water column
- Sea floor
- Marine biota
- Microplastics





Figure 5.2 Schematic of possible methods used for sampling the sea surface and water column (see Table 5.1 for further details of the methods advantages and challenges and examples of use) (image courtesy of Marcus Eriksen).

Source: GESAMP (2019), Guidelines for the monitoring and assessment of plastic litter in the ocean



Optical satellite data can fill a gap for monitoring of plastic waste





Developing satellite monitoring as a practical solution

There are some major advantages of satellite monitoring:

- No access to countries / shorelines necessary
- Insfrastructure is partly available
- No time-consuming efforts to collect plastic debris
- Times series possible
- Correlation with data from ocean current analysis
- Can be used supplementary to other methods

Strong need to elaborate a reliable monitoring method based on satellite data

Satellite monitoring of floating plastic debris

www.nature.com/scientificreports

SCIENTIFIC REPORTS

natureresearch

Corrected: Author Correction

OPEN Finding Plastic Patches in Coastal Waters using Optical Satellite Data

Lauren Biermann^{1*}, Daniel Clewley¹, Victor Martinez-Vicente¹ & Konstantinos Topouzelis²

Satellites collecting optical data offer a unique perspective from which to observe the problem of platic litter in the marine environment, but few studies have successfully demonstrated their use for this purpose. For the first time, we show that patches of floating macroplatics are detectable in optical data acquired by the European Space Agency (ESA) Sentinel 2-3 tacellities and, furthermore, are distinguishable from naturally occurring materials such as seawed. We present case studies from float or outries where supperted marks and a seawed. We present case studies from float of materials on the ocean surface were highlighted using a novel Floating Debris Index (FDI) developed for the Sentinel 2-Multi-Spectral Instrument (MSI). In Mal cases, floating aggregations were detectable on sub-pixel scales, and appeared to be composed of a mix of seawed, sea foam, and macroplatics. Building first steps toward a future monitoring system, we levergade spectral shape to identify macroplatics, and a Nave Bayes algorithm to classify mixed materials. Suspected plastics were successful y classified as platics with an accuracy of 80%.

In a relatively short period of time, the attributes of plastic initially perceived to be positive characteristicsorenized and longerity - have shifted to pose a widespread environmental problem, Within the marine context, millions of tonnes of plastic enter our occans annually as micro- to macroplastic litter¹⁴. The economic cost to marine natural capital alone is estimated to range from \$330-\$33.2000 per ton of plastic per year².

Larger plastics entering occus waters have two dates - floating on the surface. or similing due to bio-souling and/or balasting/i. If not removed by clean-up operations, macroplastics, 10-5 mm) may harm marine life through entanglement or ingestion, but will ineviably fragment and degrade into microplastics.¹⁰⁻¹ Being able to detect larger Shouling plastics in coastal waters before the plecome entangled, ingestod, exported and/or fragord an increasingly stressed marine entropy of the source of the plastic pollution can be control as the source of the character of the plastic pollution can be control as investments toward the bachtain and thruit resistince of our global marine ecosystem services'.

Research on platic detection using airborne dut¹⁰, models and theoretical tudies¹⁰ have demonstrated the potential to detect maceptakcins in optical duta^{10,10}, studies from detections in the leading technique for collecting high quality, standardised optical imagery on global scales. For detection of floating macrophasics in the resolution of 80 m, while a temporal resolutions in the system of the

In contrast with clear water, which is characteristically efficient at absorbing near infrared (NRI) to shortwave infrared (SNRI) light, loating materials including macrolague and macroplastics reflect in the NRI-MARLEND Leveraging these spectral properties makes aggregated materials floating on the occun surface visible from space. Topourally of al." recently demonstrated this with plastic targets deployed of Mylather in Greece. Spectra

¹Plymouth Marine Laboratory, Prospect Place, Plymouth, UK. ²Department of Marine Science, University of the Aegean, Mytilene, Greece. *email: lbi@pml.ac.uk

- Research to use satellite images for detection of floating plastic debris
- Sentinel-2 Earth observation data
- Plastic can be distinguished from other floating debris (e.g. Wood, large algae)
- Suspected plastics were successfully classified as plastics with an accuracy of 86%.

Study of Biermann et. al. 2020



Output 1: Sensitivity analysis of detection in selected sites.

Determination of the focal regions to conduct a continuous monitoring, (e.g. coastal areas around the major polluting rivers). A regional monitoring for selected sites will be tested.

Output 2: Change detection over time and quantitative measurements have been assessed.

Evaluation of a continuous monitoring of marine plastic pollution from selected areas. Testing possible determination of quantitative data.

Output 3: Recommendations for international monitoring procedure developed and advocated for.

A proposal for a monitoring procedure, which can be used by international institutions like UNEP for monitoring the progress of reducing marine plastic pollution in an international agreement, has been finalized. Graphics have been produced for visualization.





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- PLASTIC Sodyssey

Bob Vrignaud CTO & Co-Founder Plastic Odyssey

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PLASTIC POLLUTION IS INVISIBLE

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0,01%

80 millions t



WHERE MISMANAGED PLASTIC WASTE IS GENERATED



50000 1e+05

KG / YEAR











SOLUTIONS EXIST BUT ARE COSTLY & RESERVED FOR INDUSTRIALS



SMALL SCALE



OPEN SOURCE























INITIATE SMALL SCALE SOCIAL BUSINESSES











Guanabacoa alle 10 IDENTIFY WASTE LEAKAGE FROM AN AREA INTO THE NATURAL ENVIRONMENT







THANK YOU

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Giulia Manzetti

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PLASTIC-LESS SOCIETY ESA's Planned feasibility study





PLANNED ESA-FUNDED INVITATION TO TENDER

ESA Space Solutions is planning on issuing an open competitive tender for a feasibility study to investigate the technical feasibility and economic viability of space based applications in support of reducing environmental impact of plastics/marine litter, and define a roadmap for services implementation and demonstration.





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TOPICS OF INTEREST (EXAMPLES)

- Provide information on floating plastic debris in ocean and coastal areas; provide comprehensive map of floating marine debris;
- Develop floating debris predictive models;

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- Monitor and improve the logistics of plastic collection, waste management and recycling, and support economically and environmentally sustainable models for plastic collection, recycle and conversion;
- Assess impact and effectiveness of the recycling missions; provide ex ante analysis of impact of recycling missions;
- Develop tele-education programmes tailored to developing economies: educate the local communities on marine litter and plastic impact to the environment.



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VALUE OF SPACE



Satellite Navigation



Satellite Communications

Earth Observation

- Positioning information to support cleaning systems
- Positioning of Unmanned Aerial Vehicles equipped with optical and radar payloads to perform accurate analysis over specific areas of interest
- Provide communication for data collected from offshore sensors (vessels or other platforms) and data crowdsourcing
- Provide communication in support of tele-education programmes covering rural locations
- Provide Command and Control/payload communication link for UAVs or High Altitude Pseudo Satellites (HAPS) equipped with marine litter detection payloads
- Measuring and detecting sea-borne plastic waste
- Measuring ocean currents and as an input to predictive marine litter models

European Space Agency

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How to apply: Funding and Tender Information





ESA TENDER INFORMATION

Funded participation to ESA Space Solutions is open to any company and/or organisation, be it as group of users, public body or non-governmental organisation, residing in the following Member States:

Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland and the United Kingdom



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HOW TO APPLY

- **1. Register** (minimum 'light registration') by completing online questionnaire on ESA-STAR Registration (esastar-emr.sso.esa.int)
- 2. Download the official tender documentation (Invitation to Tender), which will be available as soon as the ITT is open (July 2020) via EMITS (emits.esa.int)
- 3. Create 'Bidder Restricted Area' in ESA-STAR
- 4. Write your Proposal using the template provided in the Tender documentation and obtain Letter of Authorization from your National Delegation (business.esa.int/national-delegations)
- 5. Submit your proposal via 'Bidder Restricted Area' in ESA-STAR Tendering (esastar.sso.esa.int)

More info can be found here: esa.int/About_Us/Business_with_ESA/How_to_do/esa-star_Registration_Process

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PLANNED ESA-FUNDED INVITATION TO TENDER

To find out more:

https://business.esa.int/funding/intended-tender/plasticless-society





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European Space Agency

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YOUR BUSINESS

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POWERED BY SPACE

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