

Citizen engagement : a driver for ocean protection

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Abstract: Marine litter is a global environmental concern affecting all the oceans and coastlines of the world. More than 8 million tons of plastic enter the oceans each year, contributing to an estimated total abundance of at least 24.4 trillion pieces of plastic particles in the world's upper oceans. They can be found floating on the surface, in the sediments, in the ice or covering the ocean floor. Since 1990 Surfrider Foundation Europe, has put the fight against marine litter at the forefront of its action. Surfrider acts to better understand this pollution, to reduce the quantitative amount of litter entering the marine environment and its impacts on the marine environment and humans. The NGO's leverages start with raising public awareness, stimulating scientific research to initiating political action in order to tackle at source this problem. The community and citizens are the heart of action programs, public engagement is the root. Citizens participate in collecting data and answering remaining questions about characteristics, distribution, transport pathways of marine litter and potential impacts on wildlife and humans as well as in policing-making. As a whistle-blower, an expert and an actor of change, Surfrider promotes the dialogue between citizens, scientists and decision-makers.

Keywords : *marine litter, monitoring, citizen science, advocacy*

An NGO committed to protecting the marine environment and its users

Surfrider Foundation Europe (SFE) is a non-profit organization whose purpose is to protect the marine environment and its users, created in 1990 by a collective of surfers who had noticed the degradation of the coastline and the pollution of the ocean - places essential to their sports practices and their well-being.

The most visible pollution, which is the reason

the non-governmental organisation (NGO) was founded, is pollution due to marine litter and especially plastic. Year after year, the amount of plastics and microplastics washing up on beaches and floating at bathing water levels has increased, inciting surfers to mobilize in order to protect their environment. From the very beginning, the association has placed the fight against marine litter at the forefront of its actions. Since then, it has been working to better understand this pollution and to stop the amount of waste entering the environment based on several levers: awareness, expertise and lobbying. Since 30 years, the association has grown and reinforced its professional status through the development of specialized expert processes

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(BENCIVENGO *et al.*, 2018) and scientific instruments (BRUGE *et al.*, 2018).

Surfrider's community is composed of ordinary citizens, students, teachers, experts, activists, athletes and artists who share a common passion for the ocean. SFE's actions in service of ocean-related issues revolve around three major themes: Water Quality and Health, Marine Litter, and Coastal Management and Climate Change.

With over 15,000 members and 49 local chapters in 12 European countries, citizen mobilisation in favour of the protection of the ocean is now more than ever a strong value on which the association bases all of its actions.

Citizens at the heart of the Surfrider Foundation Europe movement

People, whether water sports enthusiasts, activists, or simple citizens, are the first to be affected by environmental damage to their territory. They have in-depth knowledge of their territory, as they are the ones who live there. They are witnesses of environmental changes and pollution that impact their surroundings. Thus, they act to protect the territory where they live and provide highly useful information for scientists and decision-makers.

The first years of SFE's actions were marked by its desire to respond to the concerns of its community regarding environmental or health issues that public authorities or research institutes paid little to no attention to. To address water quality and health issues, the association has developed independent analysis laboratories in concerned territories. Since then, the results of weekly samplings allow water sports enthusiasts to check the quality of the coastal waters where they live all year round, all while providing support to local administrations and decision-makers engaged in actions focused on remedia-

tion, investigation and communication.

Since 1995, SFE has strived to draw European citizens' attention to the issue of marine litter through its emblematic programme, the Ocean Initiatives. The Ocean Initiatives aim to raise awareness among the general public through the organisation of and participation in marine litter collection operations. By joining these collection operations, participants become direct observers of the scale and diversity of litter pollution in their local area. Education through action is a way to raise awareness and show the impact of human activity on aquatic and coastal environments.

The people who take part in these collections are often dismayed to see the places they care about polluted by litter. This gives them a sense of commitment to address the problem. Beyond simply cleaning up their territory, citizens do not always have the right levers of action to act and reduce pollution at the source. They feel that their concerns will not be taken into consideration by elected officials, companies, or scientists. This is why SFE has structured its programme so as to collect their testimonies and echo their concerns, and to make sure that their voice and that of the ocean are heard by relevant stakeholders. To successfully carry out this mission, the association has developed an extensive litter data acquisition programme. Furthermore, the Ocean Initiatives bring together a growing number of active participants around the world. These ever-committed volunteers truly know their territory and are therefore the best-suited to share essential data on pollution: the types of litter accumulation zones, local specificities, information sources, etc.

SFE analyses, compares and disseminates this data to research institutions and promote the message from citizens to both public decision-makers and private sector (BIO INOVATION

SERVICE, 2018). The data collected by the association is now fully integrated into European monitoring programmes such as European Beach Litter assessment (KIDEYS and AYDIN, 2020).

Surfrider Foundation Europe: a bridge between citizen engagement and the world of research

Until the end of the 20th century, the world of research was relatively restrictive with very few partnerships with civil society actors. With the emergence of citizen science, a new dynamic has been set in motion in the research community (STRASSER *et al.*, 2019).

Citizen science connect scientists with citizens who wish to engage in a meaningful way in the protection of the environment. Through inclusive approaches and the development of simple and accessible protocols, citizens can actively participate in projects and scientists can access data on a large scale.

SFE is actively involved in the implementation and the development of the citizen science movement by offering citizens an opportunity to take part in scientific endeavours and redefine the limits of research topics. The scale and diversity of the SFE community enable to mobilise a lot of people across Europe, very quickly. In order to make the most of its community's involvement and ensure that the collected data is exploited, the association seeks to adapt scientific protocols and reduce bias.

Indeed, citizen science projects may be subject to certain biases that could potentially affect the quality of the data. To limit this concern, SFE strives to develop play-based tools and methodologies that make its processes easier to use (Ocean initiatives monitoring guide). Despite this precaution, there may still be biases in the database. The NGO therefore monitors the data and reserves the right to manually retain or exclude information in order to ensure the data's

validity before sharing it with scientific organisations.

OSPARITO: a protocol adapted to young audiences

As part of its OSPARITO project, SFE has adapted the harmonised protocols for the monitoring of marine litter on beaches (OSPAR/DCSMM) in order to make them fun and accessible for 10-year-olds. Here, OSPAR and DCSMM are Oslo-Paris Convention and Directive-cadre stratégique pour le milieu marin (Maritime Strategic Framework Directive), respectively. Digital and physical tools have been developed to break these protocols down into several stages. The key challenge is to keep children's attention while collecting data. The project design is based on the idea of a police investigation in order to immerse pupils in a game-like context. In this way, children are able to follow a scientific protocol with the same constraints as those imposed on associations or research organisations. The data collected and processed through this project feeds into the French beach litter monitoring programme.

Using data: a major challenge for the association

The way in which data - collected by SFE community as part of official monitoring programmes such as the French National Marine Debris Monitoring Programme or by scientific institutes - is used represents a major challenge for the association. The use of citizen mobilisation to acquire data on a problem or a phenomenon must be purposeful and contribute to the improvement of scientific or societal knowledge. Therefore, the association has strived to reinforce its professional status within the world of research and in the field, to ensure the quality of the data. The data collected by its community is

shared at local, national and European levels with scientists and coordinators of monitoring programmes.

It is essential to share data in the most approachable and accessible way possible, so that participants are aware of the importance of their actions and participation. As part of the Ocean Initiatives programme, we produce an annual environmental report using the data provided by marine litter collection organizers. The results are shared in a simple way using clear analogies so that citizens can understand the data and see the importance of their involvement. In 2021, more than 60,000 participants took part in data collections, thus enabling drafting and dissemination of this report to European communities, administrators and policy-makers.

This close relationship between the scientific community and citizen collectives is a win-win situation, allowing SFE to further its expertise regarding marine litter. Its data and projects are validated and then used by the scientific community. This recognition brings legitimacy in the eyes of relevant institutions.

Surfrider Foundation Europe is proactive on emerging issues

Thanks to the expertise it has acquired, the association can demonstrate great responsiveness and proactivity when it comes to identifying new types of pollution, dealing with emerging issues and proposing solutions to reduce their impact.

This is demonstrated in the way its community comes together to resolve problems, through the development and implementation of data collection tools, protocols and methodologies, and in the dialogues established with stakeholders including research institutes, local actors and the private sector.

From local testimonies to large-scale investigations: the case of “biomedia”

In 2009, SFE was alerted by its volunteers of the recurrent presence of a large number of small plastic cylinders along the coasts of the Bay of Biscay. Faced with these unidentified plastic objects, SFE teams conducted an investigation with the support of the SFE community and discovered that they were dealing with biomedia, also known as biocarriers. These biomedia are used to treat wastewater in collective or industrial wastewater treatment plants (WWTP). They allow bacteria to settle and proliferate, and thus improve purification rates by accelerating the digestion of suspended solids in the water.

SFE has been the first association to focus on the problem caused by the spread of these plastic media in the marine environment and the resulting increase in plastic pollution flowing into the oceans. The association has therefore started monitoring the evolution of biomedia pollution at the European level by developing a protocol to characterise and quantify them, by mobilising its community and other NGOs. As the general public is largely unaware of this type of pollution, the association has worked to raise awareness among stakeholders through educational tools, communication campaigns and videos.

A study has been carried out on the processes and ways of identifying wastewater treatment plants where accidents have led to biomedia leakage into aquatic environments (BENCIVENGO *et al.*, 2018). Thanks to proven cases of malfunctions and dialogue with professionals in the sector, this study has generated recommendations aimed at reducing the release of bio-carriers into the environment.

SFE has become a reference for its expertise on the subject (BENCIVENGO *et al.*, 2018; KARAPANAGIOTI *et al.*, 2019). The data collected

through the mobilisation of its community in the field serves as the basis for several research projects carried out by scientific organisations.

The association is a driving force for new ideas and initiates data acquisition projects when it identifies environmental issues that are seldom or not yet the subject of research work. The nature and consequences of both macro- and micro-plastic pollution in the marine environment are well-documented and are the subject of numerous studies and research programmes (BRAHNEY, 2021). These studies have demonstrated the significance of land-based inputs of litter transiting through river networks before entering the oceans (LEBRETON *et al.*, 2017). They are considered the main source of plastics (all sizes included), more than litter directly released into the marine environment (GESAMP, 2016). Although rivers have been identified as an important pathway vector (JAMBECK *et al.*, 2015), very little knowledge has been compiled about the amount or composition of litter from land-based sources.

Participatory and innovative projects in the service of research

The SFE community, composed of water sports fans and volunteers who take part in litter collection operations along rivers, had also alerted the association to this issue. In 2014, SFE set up a project called “Riverine Input” to improve general knowledge about the role that rivers play in marine litter pollution. The project initially focused on the Adour watershed in South-West France. Two initial protocols were developed and tested: a protocol for sampling macro-litter stranded along the riverbanks, and a protocol for sampling micro- and macro-litter in the water column using “manta” trawls (BRUGE *et al.*, 2018). Subsequently, this project was the subject of a collaboration with the LEESU

(Urban Water, Environment and Systems Laboratory). Namely, it focused on improving the sampling protocol, addressing the amount of time it takes to deploy the trawls, as well as the number of samples needed in order to obtain micro-plastic load values that are representative (BRUGE *et al.*, 2020). The analysis of samples from the Gave de Pau river (tributary of the Adour river) made it possible to provide an initial estimate of the amount of micro-plastics transiting via this river.

The Riverine Input project provided an insight as to the amount and characteristics of macro-litter that can be found in rivers. It helped to launch a movement at the European level for studying litter from land-based sources. However, several parameters influence the presence of this type of litter in rivers (e.g. hydromorphology; proximity of cities; waste management in the area; presence of industrial, agricultural and recreational activities; exposure to floods and wind), which makes it necessary to implement monitoring across all European rivers in order to obtain a spatio-temporal overview of macro-litter pollution. However, as the Riverine Input protocol is both time-consuming and human-intensive, there was no way it could be applied on such a scale; it thus became necessary to develop a fast, simple and reproducible methodology. In order to obtain a large amount of data that was previously non-existent, Riverine Input gave way to Plastic Origins, a citizen science project aimed at mapping a single indicator: the amount of litter per kilometer of riverbank. This indicator is calculated by monitoring sections of rivers along which citizens can report the presence of litter stranded on the riverbanks using a mobile application. In close collaboration with a large ecosystem of players in the digital world, SFE has developed an innovative technology using artificial intelligence to

automatically detect the presence of waste based on videos taken by volunteers using the application.

The mapping of collected data, enable the identification of the most affected territories by this pollution; offering solutions to local actors, in order to reduce litter at the source; and ultimately, to integrate this waste indicator into the assessment for the good ecological status of rivers.

Appealing to decision-makers: data at the service of advocacy

Associations have become key players in public policies and play a decisive role in the preservation of the environment. Lobbying is fundamental for SFE if it is to appeal to decision-making institutions, to make them aware of the urgency of the situation and to bring about change. SFE's lobbying consists of advocating for international, European, national and local institutions to adapt the legislative framework and public policies to the challenge of protecting the ocean.

With regard to plastic, SFE ensures the adoption and proper implementation of a legislative and regulatory framework for prevention and reduction at the source, which are necessary for the ecological transition and the establishment of a true circular economy. To do so, the association has a team of lobbyists who keep up with legislative, scientific and economic news, as well as citizens' actions, and present concerns and claims to the policy makers. SFE works either alone or in coalition with other NGO groups in order to strengthen its actions.

One of SFE's defining characteristics is the strong ties with both its network of volunteers in the field and the relevant decision-making institutions: its main mission is therefore to establish connections between citizens and policymakers.

The association brings the results of citizen science programmes to the attention of decision-makers in order to show them the scale of citizen mobilisation and the reality on the ground.

The data collected is analysed, compared and controlled for validation. This data supports an inventory of pollution schemes with major trends, accumulation zones and litter to be targeted in priority, because of its extent or its impact on the environment. Thanks to technical data and consultation with external experts, the teams establish hypotheses on the origin of the pollution and develop arguments in order to propose measures to decision makers, to reduce pollution at the source. SFE also ensures that the measures proposed are not counterproductive (e.g. Replacing one material with another with the same level of harm) or purely superficial in their effect. The aim is to be proactive and to insist on preventing litter rather than removing it downstream, once it has already become a problem.

In 2019, the European Union adopted one of the most ambitious pieces of legislation in the world to tackle plastic pollution: the SUP (Single-Use Plastics) Directive, Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment (Text with European Environment Agency relevance). This text, which applies to the 27 member countries of the European Union, aims to prevent and reduce the environmental impact of the plastic products most frequently found on beaches, and to promote a transition towards a circular economy. This Directive introduces a series of measures to reduce the use of certain single-use plastic products at the EU level. These measures include the ban of single-use plastic products for which reusable alternatives already exist; reducing their consumption or

production; establishing extended producer responsibility schemes; and requiring markings that stipulate the presence of plastic in certain products.

Decades' worth of fieldwork conducted by the association to quantify and characterise plastic pollution on European beaches, as well as awareness campaigns, citizen mobilisation and appeals made to decision-makers, had created solid foundations for the adoption of this text. SFE extensive knowledge and understanding of the issue also allowed the development of strong arguments and influence the proposed measures throughout the negotiation of the text.

Surfrider status, as an NGO with a vast network of volunteers, allows to quickly modify data collection so that they are adapted to new items (e.g. COVID-19 pandemic related items) and take into account improved knowledge and legislative developments. Thus, Surfrider Foundation Europe has included all the single-use products covered by the aforementioned European Directive as part of the master list of the Ocean Initiatives protocol. This amendment will make it possible to ascertain whether or not the amount of certain types of litter along European riverbanks and beaches has decreased, so as to monitor the effectiveness of the measures adopted by each of the Member States. The association can thus react quickly and propose further modifications and corrective measures.

The SFE community also alerts the association in case of chronic and local accidental pollution. This is namely the case with pre-production plastic pellets: raw material used in the manufacture of all everyday plastic objects. These are released throughout the chain of production, processing, distribution and recycling of plastic due to poor industrial practices, poor handling and transport accidents. These incidents

can thus lead to very large accumulation areas near the industrial sites. Volunteers from the association have therefore initiated local monitoring programmes (e.g. Tarragona, Spain; Écaussinnes, Belgium) to quantify pollution, determine its source and identify the most heavily impacted areas. The data collected by citizens makes it possible to call out local companies and hold them accountable, but also to justify the request for the adoption of preventive measures to national and European decision-makers.

Plastic pellet pollution has become a global phenomenon; these plastic pellets, which are very light, can be carried by both wind and rain and go on to circulate in water networks, rivers and the ocean, where they release harmful chemical pollutants (OHGAKI *et al.*, 2021).

Currently, there is no legislation that addresses this issue. There are voluntary agreements within the industry designed to prevent losses (Operation Clean Sweep), but field observations conducted by volunteers as close as possible to industrial and port sites prove them to be inefficient. It is therefore on the basis of concrete cases that Surfrider Foundation Europe calls on European institutions to adopt regulatory measures in order to prevent spills and stop plastic pellet pollution, by obliging companies in the supply chain to take action and holding them responsible in case of releases into the environment (GRAVIER *et al.*, 2020).

Citizen engagement in knowledge acquisition operations is a way of involving people in the decision-making process. In the same vein, Surfrider encourages citizens to take part in debates by explaining to them the ongoing legislative processes and showing them the ways in which they can contribute to and influence decisions through (dedicated communication and mobilisation campaigns, public consultations, etc.).

Conclusion

Since its creation in 1990, Surfrider Foundation Europe has witnessed a growing social awareness regarding plastic pollution of the ocean, thanks to active engagement of the NGO and scientific communities. Encouraged by the NGOs, citizens have been mobilizing to actively protect the environment, namely by taking part in participative science programmes. The data collected since more than 10 years have allowed to highlight the situation on the ground to decision-makers and to make the adoption of the very first measures against plastic pollution a reality. However, as we are facing the rising world production of plastic and thus, even more ocean pollution, it is crucial to demonstrate real political ambition. We have to ensure that whistle-blowers that act in the field every day, are heard. Decision-makers also have to show a greater reactivity for a more efficient ruling. Finally, public institutions and private sector face the major challenge of better considering citizen data, that is real time and covers plastic pollution all along European coasts.

There is an urgent need to act and apply the precautionary principle to protect the ocean.

Acknowledgments

We thank the Surfrider Foundation Europe team for their contributions to this paper and Surfrider's volunteers for their commitment to protect marine environment. We also thank the scientific community and specially François Galgani, Bruno Tassin and Johnny Gasperi for their collaboration and support. Special acknowledgments to Patrick Prouzet for his advice.

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Received on 20 December 2021

Accepted on 13 November 2022

