Commonwealth Litter Programme

CSIR – DSI – Cefas

Marine plastic litter workshop

Day 2 – Report

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Executive Summary

Cefas (Centre for Environment, Fisheries and Aquaculture Science), CSIR (Council for Scientific and Industrial Research) and DSI (Department for Science and Innovation) co-delivered a Marine plastic litter workshop in Cape Town on 02 October 2019. The agenda included both plenary sessions and working groups. Current gaps in policy and scientific knowledge in South Africa were discussed along with strategies to addressing them.

During the morning, three presentations introduced the work done by Cefas to study marine litter in the past decades (including its involvement in the OSPAR convention), a summary of the gaps in scientific knowledge that had been discussed during the previous day in the workshop and the current legislative framework for the waste management and environmental protection in South Africa. After this plenary session, four working groups discussed:

- Gaps in policy and solutions: the group spoke about the need for more enforcement, the ownership of litter in freshwater systems and several projects (Operation Phakisa, Khawuleza District Coordination Service Delivery Model, Good Greed Deeds Programme);
- Barriers caused by policy and solutions: the groups discussed the possible problems deriving from current EIA legislation, the conflict between the aims of different governmental departments and the current situation in informal areas;
- Behavioural change: how to promote best practices: participants agreed that communications has to be done at community, industry and governmental level and that more effort is needed to transform awareness in practical behavioural change;
- Data needed to support policy: the group discussed collecting new types of data to understand the plastic flows in the country (import volumes, commercial data) and possible ways of collecting marine litter data, expanding monitoring programmes that already exist.

The afternoon was dedicated to discussing micro- and macroplastics monitoring strategies. In a plenary session, the strategies adopted at the international and regional level to coordinate and standardise monitoring strategies were presented. New studies carried out nationally and the approach followed by NGOs involved in citizen science were also showcased. Following this introduction, two working groups were created:

- Macroplastics monitoring: the group listed a series of information that is currently missing (data on litter buried in beaches, litter released in episodic events and litter accumulated in storm drains/roads). They also spoke about storing data in a central database, using drones in monitoring and creating baselines to assess mitigation success;
- Microplastics monitoring: the group agreed that studies should be carried out to analyse the accumulation in biota and the effects on the food web. However, since monitoring and baseline studies for microplastics are too expensive and unreliable, effort should rather be focused on macroplastics.

There was a final discussion about possible solutions to marine plastic pollution, including alternative materials, the implementation of a circular economy, financial mechanisms such as Extended Producer Responsibility (EPR) and the need for awareness raising and international cooperation.

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1 Opening and welcome

Dr Umberto Binetti form the Centre for Environment Fisheries and Aquaculture Science (Cefas) introduced welcomed the attendees of the workshop (Figure 1-1). The agenda of the day was introduced, consisting of both plenary sessions and working groups. The aim of the day was to listen to what the gaps are in scientific knowledge and policy, understand what data are needed to fill these gaps and identify the preferred monitoring solutions for South Africa to ensure a constant stream of these data.

Figure 1-1 A moment of the introduction of the workshop

2 Plenary session: gaps in science and politics

Thomas Maes (Cefas) gave a keynote presentation on the monitoring of macroplastics and microplastics from the European and Cefas perspectives. He spoke about the OSPAR convention in Europe and the process through which the convention was created. OSPAR is based on protocols used in clean-ups and studies around the North Sea. Their methodologies were discussed and finalised to provide operators with guidelines on producing comparable data. OSPAR analysis focuses on several parameters, including marine litter in sediment (beaches) and in biota. Mr Maes also spoke about the work that Cefas carried out over decades to study marine litter on the seafloor and to assess the statistical power of marine litter clean-up studies. Speaking about microplastics, he showed a series of studies he did with Cefas to survey coastal waters and sediments around the UK and to address the possible release of particles from human activity through sewage leaks. He also showed the method he developed for Cefas to detect microplastics and highlighted how it was able to speed up and ease the identification and counting of particles in sediment, water and several different biota samples.

After the keynote speech, the work proceeded with two presentations that aimed to show the current achievements and outstanding gaps in both science and policy. Prof Peter Ryan (University of Cape Town, UCT) spoke about the scientific achievements and gaps, giving a

summary of the outputs of the first day of the workshop when five review papers were discussed. The papers summarised what currently known about marine plastic and microplastics in South Africa, presenting achievements and gaps in knowledge. The papers focused on 'Sources and pathways of marine plastic litter (inland and marine)', 'Transport and fate of marine plastic litter', 'Ecological impacts of marine plastic litter (biota & human health)', 'Ecosystem service and economic impacts of marine plastic litter' and 'Marine plastic litter monitoring and methods'. For more details please refer to the review for the first day of this workshop.

Mr Kgauta Mokoena (Department of Environment Forestry and Fisheries, DEFF, Figure 2-1) presented the current legislative framework in South Africa and its gaps. Mr Mokoena quoted several pieces of legislation regarding waste management based on Section 24 of the South African Constitution. He spoke about several acts and the three strategies that the department responsible for the environment has developed over the years to promote reducing, reusing and recycling. He also showed how the latest goal had shifted towards the prevention of waste through design and preparation for reuse. Mr Mokoena also spoke about the adoption of EPR with plans to apply it to paper and packaging, e-waste and lighting. He said that there are Compulsory Specifications on plastic carrier bags that were introduced in South Africa and that there is a review of their effectiveness. There is currently no policy on banning any plastic material in South Africa, but work is underway to investigate various controls and measures to be put in place. DEFF also recently received the mandate for the prevention of marine pollution due to integration of Fisheries with the previously named Department of Environmental Affairs (DEA). The need for an Integrated Marine Pollution Prevention Strategy was also expressed.

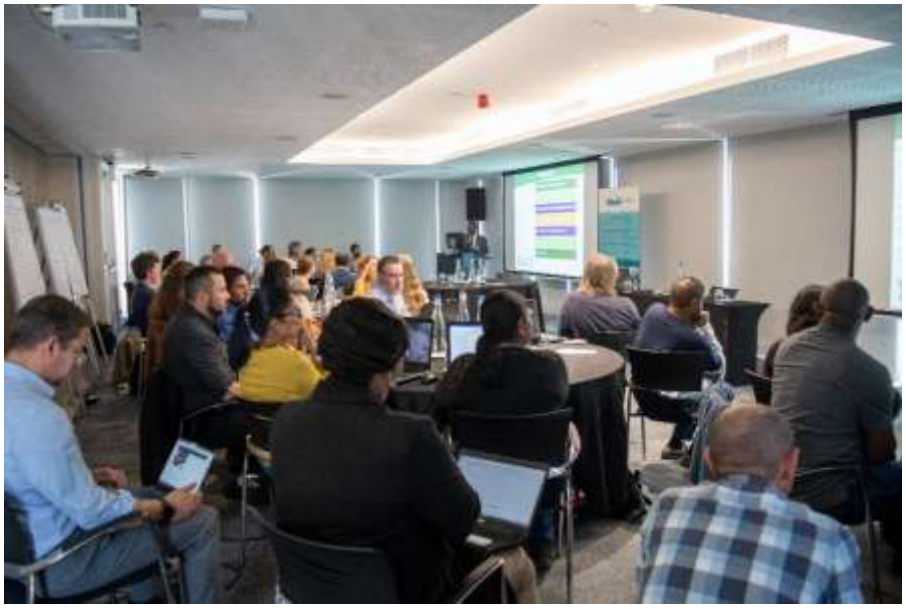

Figure 2-1 The presentation delivered by Mr Mokoena to highlight gaps in South African policy

3 Working groups: gaps and solutions

After the three plenary sessions, the workshop proceeded by dividing the room in four different groups discussing each of the following topics:

Group 1. Gaps in policy and solutions;

Group 2. Barriers caused by policy and solutions;

Group 3. Behavioural change: how to promote best practices;

Group 4. Data needed to support policy.

Attendees were given the possibility of joining one of the four groups of their choice, according to their interests and expertise. The groups indicated a Chair and then the group had 50 minutes to discuss the assigned topic. At the end of the discussion, the Chairs had 10 minutes each to present a summary of what had been discussed in their group.

3.1 (Group 1) Gaps in policy and solutions

The group (Figure 3-1) focused on policies related to waste management that are in place and on assessing whether they are working efficiently. The group addressed other major developments currently happening in South Africa such as the body of research that is carried out and how it feeds into the policy-making processes. The clean-up initiatives organised by the public sector were also considered.

It was noted that South African policies are mostly looking at processes happening on land rather than in the ocean. The group listed a few topics that should be prioritised in South Africa which were waste minimisation, improvement of waste disposal, addressing the irregular clean-ups done by municipalities, and developing the research and actions linked to alternative materials. The discussion assessed the pros and cons of the Integrated Waste Management Plans (IWMP) and then moved to analyse the results of the review, completed in 2019, carried out to analyse the effects of the plastic bag levy. The review, recognising some sort of inefficiency of the ban, suggested moving from a ban to the implementation of a circular economy that boosts the recycling sector. The existence of a similar review focusing on the use of single-use plastics was also highlighted. It was also agreed that the development of legislation on alternative materials needs a better understanding. The need to assess the viability of the different alternatives compared to other products was also discussed.

Operation Phakisa, that aims to fast track circular economy, was also brought up during the conversation. One of the key elements of Operation Phakisa is the separation of waste at source, which needs to be mandatory to work efficiently. Appropriate laws need to be implemented at municipal level, and current bylaws are under review. Operation Phakisa also introduced a system of plastic pellet plants to support the growth of recycling plants in each province. The collection of low value items was also considered as an issue to be solved to reduce the leaking of materials in the environment.

The ‘District model’ was suggested as a system to improve waste management. The system is based on the Khawuleza District Coordination Service Delivery Model, a current project focused on a single district. The idea is that rather than addressing the problem on a national scale, all the effort of the administration is focused on reviewing and upgrading the local services of a

single district through different approaches (clean-ups, resource recovery). The final goal is to synchronise all levels of the government to have a waste management system that operates correctly within that specific district, which is then used as a pilot to develop other areas. This is a top-down approach, with action started by the President himself.

Another project discussed by the group was the Good Green Deeds Programme, launched in March 2019 and based on the top-down model used in Rwanda. The Programme encourages clean-ups, discourages illegal dumping and promotes sustainable waste management practices. It aims to galvanise the South African society into changing behaviours and preventing pollution while reducing waste.

The discussion seemed to highlight that in South Africa there are not necessarily gaps in policy, but rather the implementation is an issue. The compliance and enforcement are not optimal across government and need to be substantially improved, particularly in fields such as local service delivery, and in informal areas where no rates are collected to support service delivery. The lack of local bylaws preventing pollution and marine litter, and the need to work out how to make technological solutions mandatory for both local government and national government were also highlighted as problems.

A major gap in policy discussed was the uncertainty about who is responsible for the litter entering the rivers. The lack of clarity prevents a clear mandate of responsibility and enforcement. The Department of Water and Sanitation views this as the responsibility of DEFF or local government. However, DEFF holds the view that it should be the Department of Water and Sanitation's mandate, with local authorities responsible for implementation. Data are needed (knowledge or review gap) to show the impact of litter on freshwater systems since such impact would deliver the mandate to the Department of Water and Sanitation.

The utilisation of the Green Scorpions in a targeted local level intervention for a concentrated time period was also suggested.

Further to the above discussed barriers on service delivery, enforcement and compliance, the Environmental Impact Assessment (EIA) process is acknowledged as a barrier to the recycling industry.

Another solution that came out in the discussion was the development of education campaigns and operations around the country to promote waste reduction.

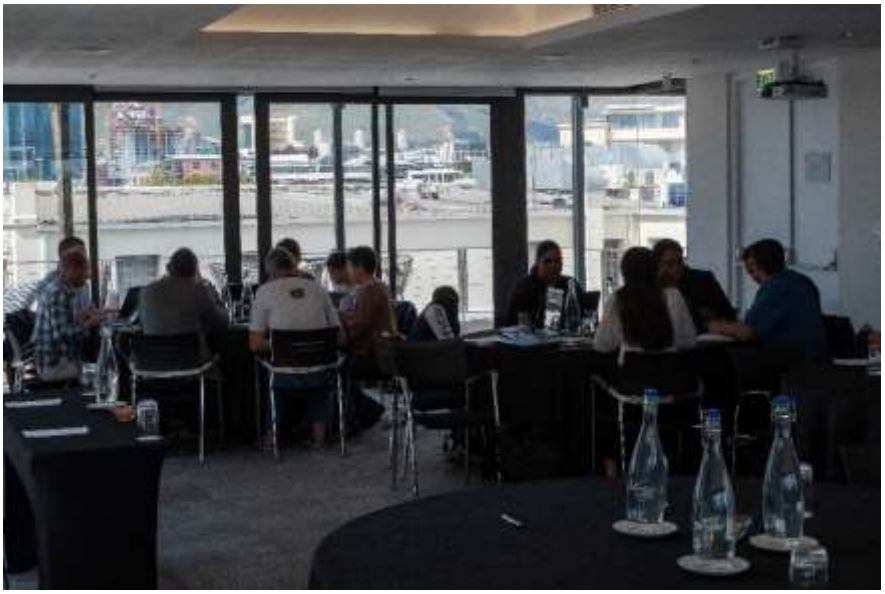

Figure 3-1 Groups 1 and 2 during their discussions

3.2 (2) Barriers caused by policy and solutions

The group (Figure 3-2) noted that current legislation is standing in the way of the recycling industry by imposing lengthy and expensive EIA procedures for new facilities. Before applying for an EIA, companies need to have a pre-existing facility. This system is inefficient, especially if the EIA is unsuccessful and leads to the need to create another new facility. According to the group, small businesses are particularly affected by the current legislation and there should be subsidies and incentives for new activities. However, it was noted that rules vary according to the volume of waste processed and that below a certain threshold some permits are not required.

There was also discussion on the fact that most waste is collected by informal workers. There is a need to improve the regulation of this process, or at least to make it safer, by providing essential services (such as ensuring safety with appropriate PPE, transport to recycling centres etc.). Dealing correctly with this informal sector was seen by the group as a fundamental step because its disruption could collapse the entire collection system. The effect of the informal sector on the official recyclers must also be taken into account.

One of the institutional barriers lays on the uncertainty of roles between DEFF and the Department of Trade and Industry (DTI). The two departments are also conflicting; the increase in use of plastic is seen positively by DTI because of the increased business; however, DEFF aims to reduce plastic use to decrease the amount of waste produced. The definition of waste and its consequences must therefore be agreed by the different departments. In defining waste, the departments should also consider how to identify what material has still value and potential to create a circular economy.

During the discussion a few laws were mentioned, such as the 'National Environmental Management Act (1998)' which includes an integrated pollution and waste management, the

plastic ban, the process for non-compliance offences and the 'National Environmental Management: Waste Act 2008' that defines national domestic waste standards, national waste management strategy and had a few amendments.

The discussion about the collection of waste carried out by municipalities highlighted potential problems. The administration is affected by the fact that the service is given to private companies with short-term contracts (three years). There is already a backlog to deliver the service and the local authorities are under-resourced to catch up with new policies. The implementation will differ according to the economic situation of the municipalities considering that separation might not be profitable and lead to losses. The group therefore expressed the need to identify best practices and apply them to the entire system.

The lack of implementation was also discussed as a problem in the country. There is low public awareness and a negative attitude. In fact, despite a progressive attitude towards the politics of implementing a circular economy, disposal at landfills is still the main fate of most of the waste. It was then discussed whether more implementation is needed, rather than new policies. As an example, the table discussed the plastic bag levy and the current low compliance and enforcement at a national level, as evident with the production of bags that are substandard.

Figure 3-2 Group 2 discussing barriers caused by policy and their solutions

3.3 (3) Behavioural change: how to promote best practices

The group discussed whether individuals or companies (or both) should lead the change in behaviour. It was agreed that there is a need for a stratified behavioural change, using different strategies for different sectors to obtain change at a legislative, governmental and personal level.

Speaking about education, the group discussed creating an attitude of 'care' for the environment starting from children. The group suggested including the topic of marine litter in school curricula and it was noted that EcoSchools (currently run by school clubs) already have

modules that could be used. Another suggestion was the use of 'Waste Diaries' (Expenditure Diaries), in which school children take datasheets home to note down, along with their parents, what they are throwing into their rubbish bins. The US National Oceanic and Atmospheric Administration (NOAA) has done this in USA and the concept is currently being tested by StatsSA in South Africa.

Awareness at national level should also be created to make people aware of damages to the environment. Recycling could be advertised on TV. This could be a collaboration with well-known companies (e.g. Nando's) to make funny and catchy adverts, and with influencers on social media. It should also be obligatory for brand owners to push recycling. These campaigns should aim to change behaviours at all levels of the socially complex South African society (communities, industry and government).

Community

Outreach is already undertaken by various organisations that are going out to communities to educate and conduct surveys through questionnaires. There is the need for more awareness campaigns in order to teach communities that their actions can harm the environment. Higher awareness would be useful to tackle the problem of low compliance, considering that there are no consequences when laws are broken (people dumping next to signs saying 'No dumping'). Given the problem that some municipal workers are afraid to go into certain communities, there is a need for establishing good relations between communities and municipalities.

Possible constant messaging about behaviour people should adopt (behaviour nudges, e.g. the 'save water campaign' in Cape Town that caused many people to change their behaviour) was proposed. There is also the option of giving people incentives to change behaviour, such as incentives to collect recyclable items.

Industry

The groups suggested that industry should be able to provide alternatives to plastics, items designed for easy recycling and items made to last a long time. All these actions would help circularity and should fit into a system that includes all stakeholders in the production and distribution chain, from the raw materials to converters, brand owners and retailers. Educating the retailers would also be a way of creating agents of change to educate and inform people who can then put pressure on government to change policies. This was seen as a possible way forward considering that environmental pressure has provoked industrial change in the past.

Another mechanism is EPR, a system that can change industries' mindsets and actions. EPR is voluntary but this should change and become compulsory by law.

Government

The role of the government was also discussed. Government needs to aim to reduce litter as they did for saving water. Industry should be involved in building infrastructure and facilities and the government should subsidise virtuous industries and create drives to the end market through incentives. Government also has to address widespread lawlessness.

3.4 (4) Data needed to support policy

The group (Figure 3-3) discussed the paper by Jambeck et al.,2015 which listed South Africa as the 11th worse land-based litter producer in world. Doubts were expressed about this ranking because in the paper the amount of waste was estimated based on GDP, population density and mismanaged waste instead of using empirical data. This is probably because there is a lack of data, which is also a major issue facing any action that would eventually feed into policy.

Speaking about financing, the group suggested that investments in Africa should be focused on solving problems on land to prevent plastics from entering the environment in the first place. When speaking about mitigation policies, environmental monitoring is key because it can show if these strategies are working. In order to carry out this monitoring, projects that are already in place can be used (e.g. Dirty Dozen). South Africa has ongoing water quality testing such as the River Health Program, to which a monitoring plastics component could be added. Fishing boats could also be obliged to report any litter found in their nets.

The group was aware that there are many calls for banning single-use plastics, but that evidence is needed to support its effectiveness. In fact, data on how many items entering the environment and measurements of the abundance of single-use plastics in the environment before the ban are missing. Data on the impacts of plastics on the environment are also missing, especially on benthic ecosystems. Particular attention should be given to the survey of point sources (e.g. stormwater drains/wastewater treatment plants) when evaluating the efficiency of mitigation strategies.

The presence of compliance monitoring is also important because implementation of policies is pointless if no one complies with them.

The communication of monitoring data to the government and the public should be done with care. One way to do this is to write annual reports (IPCC report could be used as a template). The dissemination of any data and information to the consumers requires report production to be transparent.

Another possible action is based on data about specific brands found as litter in the environment, which can be used to highlight main producers of plastics that should implement EPR.

<u>Operational monitoring</u>

The group asked what should be monitored due to differences in the catchment areas (for example, rivers) and accumulation/turnover dynamics.

Apart from the litter in the environment, there are also other types of data that can be monitored: what comes into the country, what is being produced in the country, what is happening to the plastics, what is economically recyclable and what is actually being recycled.

Knowing which products and materials are imported into the country is useful for implementing policies that manage what is imported into South Africa. Data on the amount of plastic that is not recyclable are also important and retailers should be held responsible for using recyclable plastics and for additional actions such as moving away from colourants. Looking at the private ownership of these types of data in Europe, the group also noted the need to increase transparency.

Economic data

The working groups also stated the need of data from the socio-economical side of the problem. Economic means are a real issue in addressing marine litter in South Africa when compared to a more emotional approach that leads the tackling actions in Europe. Therefore, changing the focus from the environmental to the economic impacts might make actions more viable in South Africa.

Environmental awareness is helpful but waste minimisation at the product level is required, for example looking at product design and imposing recycling targets on producers. These issues must be discussed with stakeholders, which leads again to the need for data on the social aspects and the economic impacts of the issue and of the incentives. An example would be to assess the economics of blue flag beaches; reducing litter on beaches increases tourism and leads to an increase of income to the area, which makes it worthwhile for people to pick up the litter and to establish economic enterprises.

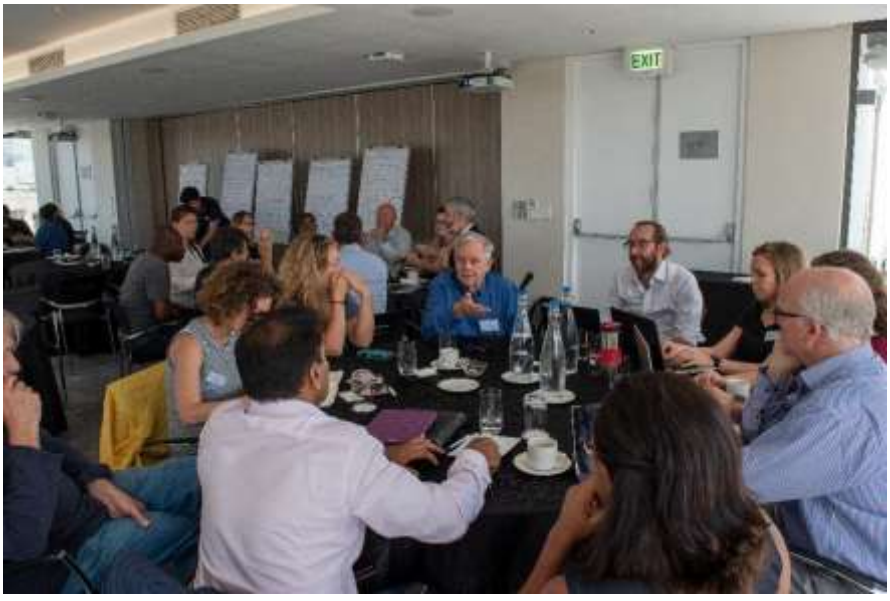

Figure 3-3 Group 4 discussing data needed to support policy

4 Plenary session: monitoring

The goal of this plenary session was to present monitoring strategies on different geographical scales. These presentations showed how coordination in monitoring activities is ongoing in

order to standardise methods and facilitate knowledge and data sharing. These presentations provided a framework for the discussion about the monitoring of microplastics and marine litter that followed at the end of the plenary session.

Dr Binetti (Cefas) presented the international aspects of monitoring. He showed how the UN is dealing with marine litter with specific targets within Sustainable Development Goal 14 (Life Below Water) and discussed other UN initiatives such as the United Nations Environment Assembly (UNEA) and the United Nations Environment Programme (UNEP), which try to coordinate the effort for monitoring marine plastics and microplastics sponsoring initiatives such as the Global Partnership on Marine Litter with the development of Action Plans. He also showed that protocols to standardise data gathering at a global scale are also published through the joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP). Monitoring carried out by citizen scientists is also coordinated through several international initiatives such as the International Coastal Cleanup by Ocean Conservancy.

Scaling down to a regional effort, Toshka Barnardo (Sustainable Seas Trust, SST) presented the monitoring activities that the SST is carrying out for the African Marine Waste Network (AMWN). This project involves research, education, enterprise development and communication/networking. SST is carrying out the Western Indian Ocean Marine Science Association (WIOMSA) three-year marine litter monitoring for macro-litter, meso-litter, rivers and stormwater canals in seven African countries have coastline along the Indian Ocean. They study litter standing stock and accumulation rates using a standardised protocol and they are currently developing a manual. They also use innovative systems such as apps and remote sensing with drones and carry out international workshops to ensure that protocols are understood and followed by the operators.

Prof Peter Ryan (UCT) presented an example of a new monitoring area that he recently developed to analyse plastic bottles found on beaches. The research has shown an increase in the number of bottles of Asian brands being stranded on South African beaches. Modelling the debris dispersion patterns and looking at the very low presence of these Asian brands among litter in the city waste, he concluded that the majority of marine litter found on beaches in South Africa originates at sea, which challenges the current view of marine litter originating principally (80%) on land rather than at sea.

Maria Honig (the Beach Cooperative) presented the NGO she works for, which is devoted to cleaning South African beaches while empowering coastal communities and reducing the use of single-use plastics. She presented the approach of citizen science to beach litter monitoring and introduced the concept of the Dirty Dozen, a group of twelve single-use items commonly found on South African beaches. The Dirty Dozen became the focus of clean-ups carried out by the Beach Cooperative, which were increasingly more successful over the years. The Beach Cooperative saw in the past few years a significant increase in the number of people involved, number of clean-ups, length of coastline cleaned and amount of litter removed.

5 Working groups: monitoring

After the presentations, two new working groups were established to discuss macroplastics monitoring and microplastics monitoring. The goal of the working groups was to identify parameters, protocols and any other details that could be useful to implement or improve monitoring programmes in South Africa. Similarly to what had been done for the working groups during the morning sessions, attendees were given the freedom to choose which one of the two groups they wanted to join. Each group nominated a Chair that, after one hour, gave a brief summary of the discussion.

5.1 Macroplastics monitoring

The group that focused on the monitoring of macroplastics started the discussion referring to the importance of defining which scientific question is asked when monitoring plans are designed. It was suggested that funding of the research should be connected to pilot studies and policy changes. The group also asked who is responsible for funding and planning monitoring and who can make sure that it happens in the best way. It was suggested that there should be a connection between government/policy and academics.

Several gaps in knowledge were identified as focus areas for future research. The scientific and regulatory community needs data about the paths of litter on land (including in storm drains and on roads), about the release of marine litter during episodic events and about buried litter linked to rising sea levels and landfills close to the sea.

It was suggested that all the data should be stored in a database where data can be accessible to everyone and protected for posterity. The database should be managed by the South Africa Environmental Observation Network (SAEON) or DEFF and should also include an embargo on the use/access of data to allow for scientific articles to be published without interference. The database would help with harmonising protocols, since depositing data in a shared database would require the adoption of standardised methodologies and categories. Basic form-sheets should be available and should be the base for any complexity added to the surveys.

Using drones was suggested to collect more data and to ground truth estimates. Drones would be also useful to collect data in informal settlements or areas where it may not be possible to survey. Data from drones could also be used in measuring the impact of education campaigns. This technology could also be used to study episodic events.

The group also spoke about the creation of baseline datasets to understand the effectiveness of mitigation policies. These baselines could be acquired either through specific and separate monitoring programmes or be included in other data collection programmes. It was also agreed that any signal in the record deriving from the effects of mitigation policies should be strong (such as half or double).

5.2 Microplastics monitoring

During the discussion, the group raised the question of why microplastics should be monitored in Africa. It was suggested that microplastics monitoring is not necessary in Africa, since establishing baselines of microplastics abundance and characteristics can be difficult and expensive, and funding in Africa is limited. However, research should be carried out to assess the impact of microplastics on the food web.

It was also noted that a few monitoring schemes are already in place and could be used to collect additional data with limited costs. For example, DEFF is carrying out surveys at sea twice a year, which could be used to collect water and/or sediment samples at relevant locations. Sediment samples were indicated as the most relevant to assess the presence of microplastics in the environment, as they act as a sink. However, the costs of analysing the data remains an issue.

In addition, interest was expressed for the assessment of the presence of microplastics in the food web, and their potential bioaccumulation and impacts on the physiology of individuals, the survival of species and other effects. The group suggested focusing on invertebrates because many are filter-feeders (bivalves, see river study by Nel et al.), but small pelagic fish are also good candidates since microplastic retention times are known.

During the discussion it was also said that it would be important to study pollutants/toxins associated with plastic, especially considering that longer-term exposure effects on fish will increase toxicity. This would be important in aquaculture and in freshwater fisheries because many people depend on rivers and a lot of waste-water treatment end up in rivers. At present, there are no facilities in South Africa to conduct such analyses. However, it was noted that many studies looked at the impact of plastic-associated pollutants and found very little evidence of negative impact.

The group concluded that while studying microplastics in Africa may be of interest, it will not contribute to solving the issue of plastic pollution in the oceans, so emphasis should remain on macroplastics.

6 Open discussion: solutions identified by science

The last session of the day was a plenary discussion about possible solutions to marine litter in South Africa in the future, based on the expertise and educated opinions of the attendees.

The first suggestion was to focus on stopping illegal dumping. However, a clear solution to this problem was not identified and it was recognised that this is a complex topic. Furthermore, some aspects such as the formalisation of the informal sector are of particular concern in South Africa due to their social and economic impact.

The industrial sector has already started initiatives that will reduce marine litter accumulation in South Africa. These actions include education activities and material, clean-ups and other

initiatives for improving waste management. Public and sectorial discussions on maintaining the value of material in the loop are also organised.

Alternatives to plastics such as bioplastics were also discussed. It was agreed that a better understanding is needed on how they work and what their impact is. The alternatives should be certified, and standards should be created. It was also suggested that definitions (for biodegradability for example) should be agreed, standardised and clearly stated on products. The CSIR is funding a project looking at biodegradable plastics and recycling contamination. Some of these plastics seem to be recyclable, but some are of lower quality.

Examples of projects that explore alternatives performing life-cycle assessments were presented. These studies aim to understand the overall impact of the alternative materials and inform policy about the best solutions to implement. Some of these studies are funded by South Africa, in particular by CSIR, in collaboration with the Kenyan and Japanese governments. The programmes involve academics, governmental agencies and industry.

Reusing and recycling were discussed. Moving towards reusable items would mean distributing goods in an alternative way to the current business as usual, for example implementing a system of refill stations for the products. This was seen also as an opportunity for small business development and innovation challenges. In order to boost recycling, specific design is needed. DEFF could also put in place targets for waste diversion from landfill, which would force industry to respond and comply. This would be an easy way to keep material into the service chain and out of the environment. However, it was recognised that this system needs adequate infrastructure in place. The World Wildlife Found (WWF) is developing a South African Plastics Pact that has several aims including increased recyclability and reduced use of single-use plastics and packaging. The Pact goal is to set national targets to be followed by brand owners, producers, retailers and any other member that registers.

The importance of behaviour change and education in tackling marine litter was recognised. SST is developing educational material for school curricula and other resources to be used in schools. For this to happen, big investments are required for awareness campaigns. It was suggested that in order to help outreach campaigns, industry may reinvest money gathered through EPR. However, it was argued that even when campaigns are in place, the message does not always lead to positive behavioural change.

The group of attendees also recognised that scientists have the responsibility to share research findings and data with the general public in a format that is easy to digest. There are currently very few science journalists in South Africa, and this should be improved. There are international programmes (UNES) that offer training for scientific/environmental journalists and South Africa should look into this opportunity. NGOs such as the WWF plastics programme have communication strategies with robust science behind it, showing an example of a possible channel between scientists and the general public.

Education was not considered sufficient in solving the problem of illegal dumping in informal settlements. Dumping is uncontrolled because alternatives are lacking and infrastructure is insufficient (citizens have nowhere to put waste). This situation can change if tackled by local

government. Waste needs to be collected, but municipalities have the problem of finding a system to safely collect and dispose waste that can be financially sustainable.

Another aspect that was discussed was the need to give people a choice and an alternative about how to dispose waste. Sorting at source has limited value if all the waste is delivered to landfill anyway. Even during beach collection volunteers might think that collected waste is recycled while it goes to landfill instead, and this might frustrate their efforts and willingness.

The sorting and access to infrastructure is also a problem because many municipalities do not have the resources or capacity (infrastructure, human power, money) to comply with the law standards. However, in 2015 local authorities had access to nine billion ZAR to carry out collection, transport and dumping. Therefore the problem might be the governance, which is locked in a traditional system, rather than lack of funding. The situation is also aggravated by low enforcement of municipal bylaws, with low frequency of punishment and fining/ticketing. It must also be considered that large informal settlements might require 80+ years to be solved according to planning permission authorities.

EPR was also mentioned following the discussion presented by Mr Kgauta Mokoena at the beginning of the day. There is however the problem that EPR could be used improperly; it is implemented as a tax, but revenue is not used for waste management. The industry would be supportive of the system if correctly implemented, and has a current scheme that is voluntary but needs to be mandatory. However, EPR should be carefully planned so not to become a tax which affects consumers.

To finish, it was stated that tackling marine litter should be an international action since this problem is of global scale. In order to achieve a global action, everyone needs to cooperate by following the same rules. A framework was therefore suggested (an International Panel for Marine Litter) which could potentially become part of the Stockholm convention or other similar conventions covering trade in plastic waste.

Appendix 1: List of attendees

Peter Ryan	University of Cape Town
Coleen Moloney	University of Cape Town
Eleanor Weideman	University of Cape Town
Mark Graham	GroundTruth
Lorien Pichegru	Nelson Mandela University
David Glassom	University of KwaZulu-Natal
Olusola Olaitan Ayeleru	University of Johannesburg
Zaynab Sadan	WWF
Lucienne Human	South Africa Environmental Observation Network
Fiona Piller	WWF
Sumaiya Arabi	Council of Scientific and Industrial Research
Trishan Naidoo	University of the Western Cape
Stephen Lamberth	Dept Environment Forestry and Fisheries
Henk Bouwman	Northwest University
Tony Ribbink	Sustainable Seas Trust
Carina Verster	Northwest University
Toshka Barnardo	Sustainable Seas Trust
Danica Marlin	Sustainable Seas Trust
Carl Van Der Lingen	Dept Environment Forestry and Fisheries
Takunda Chitaka	University of Cape Town
Kgauta Mokoena	Dept Environment Forestry and Fisheries
Anton Nahman	Council of Scientific and Industrial Research
Juliet Hermes	South Africa Environmental Observation Network
Yazeed Peterson	Dept Environment Forestry and Fisheries
Pamela Nxumalo	Dept Environment Forestry and Fisheries
Mark Gordon	Dept Environment Forestry and Fisheries
Maria Honig	The Beach Cooperative
Anusha Raykaran	University of the Western Cape
Douw Steyn	Plastic SA
Linda Godfrey	Council of Scientific and Industrial Research
Thomas Maes	Centre for Environment, Fisheries and Aquaculture (Cefas)
Fiona Preston-Whyte	Centre for Environment, Fisheries and Aquaculture (Cefas)
Adil Bakir	Centre for Environment, Fisheries and Aquaculture (Cefas)
Umberto Binetti	Centre for Environment, Fisheries and Aquaculture (Cefas)
Josie Russell	Centre for Environment, Fisheries and Aquaculture (Cefas)

Appendix 2: Agenda and group picture

Table II-1 Agenda of the day

8.30 – 9:10	Registration and coffee
9.10 – 9:40	Plenary session Welcome and keynote speaker
9:40 – 10:10	Plastic marine litter in South Africa, known knowns and known unknowns
10:10 – 10:40	Policy overview and gaps
10:40-12:30	Workshop – Four groups to discuss: • Gaps in policy and solutions • Barriers caused by policy and solutions • Behavioural change: how to promote best practices • Data needed to support policy
12:30 – 13.30	LUNCH and group picture (Figure II-1)
13.30 – 14:15	Background on monitoring methods – focus on global, national, regional and citizen science
14:15-15:45	Workshop – Two groups to discuss: • Marine litter monitoring • Microplastics monitoring
15.45 – 16.15	TEA BREAK
16:15 – 17.00	Open discussion: solutions identified by science

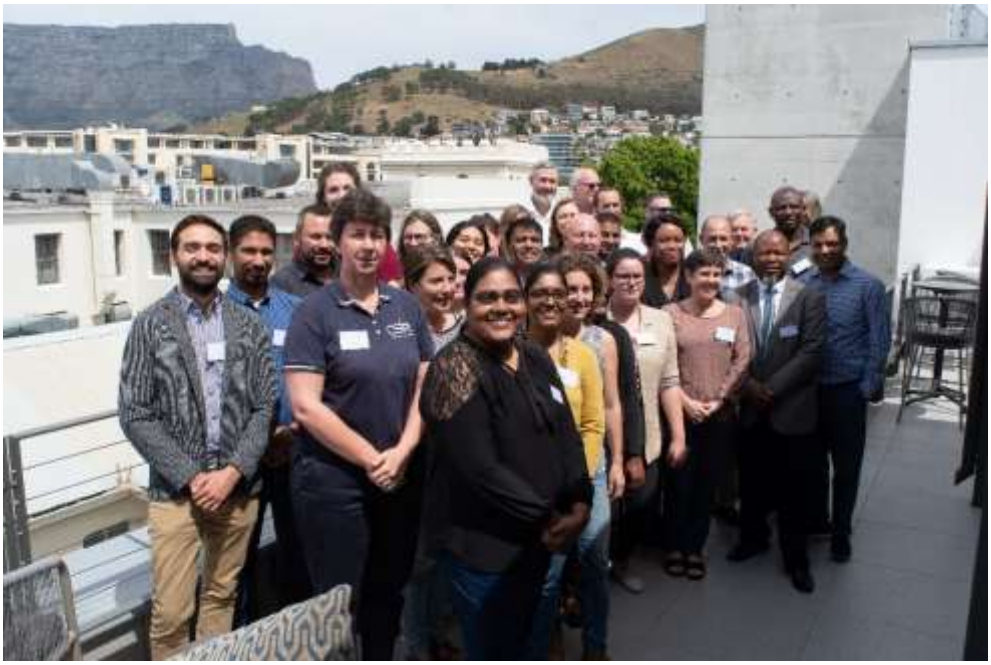

Figure II-1 Group picture with all attendees of the workshop

Centre for Environment Fisheries & Aquaculture Science

Cefas

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