



AFRICAN MARINE WASTE CONFERENCE

Workshop Outcomes Report

Port Elizabeth,
South Africa
9 – 13 July 2017

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1. Introduction

The 2017 inaugural African Marine Waste Conference was held 9th-13th July in Port Elizabeth, South Africa. The conference was attended by approximately 200 delegates and experts from 9 African states and a further 10 countries from other continents. The conference sought to act as a platform for these delegates to discuss issues including data and research, capacity building, prosperity through the development of economic enterprises centred on waste management, education and awareness and the role of the consumer, government, industry and municipalities. The focus was on innovative solutions that cater to African circumstances and cultures and using opportunities to shape a brighter future for the human health, economies and environments of Africa.

In addition to presentations, panel discussions and parallel sessions, workshops on microplastics, data and research, and mobile applications were held over the duration of the conference with the last day being devoted exclusively to workshops. On this final day, conference delegates contributed to and collaborated on developing the *“Marine Waste Strategy: Guide to Action for Africa”*, a strategy plan for tackling and alleviating Africa’s waste problems as well as refining objectives and the structure of the African Marine Waste Network (AMWN).

The following is a report on the outcomes of these workshops based on notes provided by delegates at workshops and discussion groups, and prepared by the African Marine Waste Network Team with contributions from Fauna and Flora International (FFI) and workshop facilitators. This report attempts to capture as faithfully as possible the comments and ideas of delegates, and may not accurately reflect the views of the African Marine Waste Network team.

2. Microplastics Workshop

Monday 10th July

2.1 Workshop design

The mini-workshop (50 minutes) was sub-divided into three groups. Each group discussed microplastic research in Africa with a focus on knowledge gaps. Groups also discussed the role of the African Marine Waste Network (AMWN) in promoting collaborative efforts.

2.2 Knowledge gaps

Step one: Formulate a working group

A **working group** needs to be formulated to examine the best methods for Africa. These may be different to standard international methods. Africa needs **affordable** and **simple** methods for monitoring microplastics and filling knowledge gaps. The working group needs to consider **how microplastics are identified**; is there an easier way to ID microplastics with limited funding or should there be investment in international methods, although they may be expensive? This should be included in the strategy document that will be distributed to various members.

Step two: How big is the problem in Africa?

- Should we continue to focus on many small projects or do we need to initiate a continental project? This is fundamental in determining baseline data for Africa.
- There is a need for **long-term monitoring** that investigates temporal trends. This is difficult as most projects have short-term funding for small isolated projects. This results in data with limited spatial and temporal coverage, i.e. snap-shots in space and time.
- Understanding **source/sink dynamics** is vital. We cannot only examine the marine environment but should also include freshwater bodies, estuaries, etc. Africa has three very large freshwater lakes, The Great Lakes, as well as many other slightly smaller waterbodies. Many communities rely on these freshwater lake ecosystems as a source of food and water, transport and income through the tourism industry.
- Can we **quantify** the amount of microplastics leaching into the environment from the various municipal areas? This will assist identification of hotspots and major sources, focusing mitigation methods. Could this be modelled in some way, using the number of people, infrastructure, and factories etc. as indicators? This may give us an estimate of microfibrils, microbeads and nurdles released in an area.
- We need to understand the role of Waste Water Treatment Plants (WWTP) in removing/retaining microplastics.
- Can we assess **production data lost through transit**? For example: How many nurdles are produced (weight) and how many are lost? Where does the major loss occur?
- Is there a role for **citizen science** in microplastic research? How would one go about involving the public?
- What is the role of **washing machine filters** in reducing microfiber release into the aquatic environment?
- **Biodegradable plastics**: do they result in more microplastics?
- Can we **quantify large plastics** and **model decay rates** to estimate the possible amount of microplastics in an area? This can be verified with actual samples taken from the water or sediment.

2.3 Future directives

In general, the African Marine Waste Network should promote joint projects (i.e. multiple institutes, countries and sectors), that incorporate a wide geographical distribution along coasts, estuaries, rivers and lakes. The AMWN could assist in connecting experts to formulate collaborative projects, and this could attract more funding opportunities. Funding is often limited and the Network can assist in communicating various funding initiatives. The AMWN should also be a portal to share papers, data and projects; updating members on what is being done and what needs to be done. Researchers should not work in isolation; the Network can be a platform to allow researchers to communicate with other researchers, the public and various sectors. This platform will assist research conducted to inform government officials, which may result in change and implementation of policies.

3. Data and Research Workshop

Tuesday 11th July

*This report section was contributed by Jonathan Knox,
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3.1 Workshop design

The workshop was subdivided into four groups each focusing on a different stage of plastic to ocean vectors. The groups followed the SAFE-BOLD framework, assessing each project against the structure while attempting to source a balanced number of ideas which were either: Small, Achievable, Following and Easy (SAFE) or Big, Outperforming, Leading Edge and Difficult (BOLD).

The four workstreams assessed by the groups were: Plastic Sources, Transportation – Land to Riverine Systems, Transportation - Rivers to Estuaries and Ocean Sinks. In examining the various ideas and potential projects a number of data gaps and potential future funding streams were identified.

3.2 Outcomes

The areas which were most commonly addressed across all four groups were the need for **spatio-temporal baselines** with which to measure against, the use of **GPS Tracking** to trace waste routes through land and seascapes, the use of **remotely sensed technologies** from **drones** to **satellite imagery** to quantify waste amounts and estimate **waste proxies** such as vegetation stress in transitory land sinks, **interpolation and extrapolation** of point data using spatial autocorrelation and statistical modelling, determining impacts of **macroplastics as a vector for disease spread** along with the potential to tap into **health industry funding** and finally the use of **supply chain and production data** in highlighting bottlenecks at source.

The main themes suggested from each individual group are outlined in detail in Table 1.

Sources	Transportation – Land	Transportation – Riverine Systems	Ocean Sinks	
Land fill data to estimate the amount of waste which does not reach managed areas	Spatio-temporal baselines	Small data sampling from tributary streams	Passive data collection from actors in oceanscape	
Plastics use by Household data	Interpolation of sample data points	Quantification of waste within individual water catchments	Incentivisation of waste collection by fishing industry through offsetting port fees- GPS location of waste collection	
Production data	Satellite data	Data from dam reservoirs as transitory sinks	Satellite imagery to estimate extent of ocean surface waste	
Socio-economic data	Drone Data	Use of hydrological silt models to estimate plastic flows	Sonar/ADCP data to identify macroplastics through 'waste signature' beneath surface. This will allow for average area depth calculation in future	
Human Migration patterns (migration as a proxy for unregulated waste)	Waste tracking through GPS	Use of drone and satellite imagery for direct quantification of waste but also for spectral proxies such as NDVI for vegetation stress analysis as metric for waste presence.	As part of EIA requirements companies should be mandated to estimate amount of waste in offshore concessions	
Spatio-temporal baselines	Supply Chain bottlenecks – locations where large amounts of plastics are used with possible ingress into terrestrial environments	GPS Tracking of waste within riverine systems but also a standardized methodology for doing this.	Interpolated data points from water column sampling for microplastics as a predictive measure	
N/A	Macroplastics as a vector for disease spread through the collection of stagnant water	Macroplastic distribution as an indicator for microplastic presence	Ballast water sampling for microplastics/engine cooling system automated sampling for microplastics	
N/A	Modelling macroplastic decay rates to predict potential microplastic locations	Macroplastics as a vector for disease spread through the collection of stagnant water	Macroplastics as a vector for disease spread through the collection of stagnant water – floating disease sinks making landfall cause incidence spike	
Biggest Data Gap Identified	Brand owner data access – for barcode search to locate waste sources relative to distribution centres	Most prevalent transitory land sinks which make the jump into hydrological flow routines.	Freshwater hydrological flow data, including rainfall.	Macroplastic ocean extents – seascape level

Table 1: Workshop Group Outcomes

4. Mobile Applications Workshop

Wednesday 12th July

4.1 Workshop design

This workshop began with a brief overview of existing Mobile Applications aimed at tracking and monitoring waste. Facilitators Jenna Jambeck (representing Marine Debris Tracker) and Jaka Kranjc (representing the developing application at Let's Do It World) went on to highlight the usefulness of Mobile Applications in acquiring data for research purposes, generating awareness of waste in the environment and promoting action from the general public. The workshop was then sub-divided into four groups and each assigned a different question relating to the design and implementation of mobile applications.

These questions were:

1. What data should be collected?
2. What should be done with the data collected?
3. How to ensure broad and timely coverage
4. How to leverage mapping for activation and educational purposes.

After 20 minutes the participants of the workshop were asked to switch groups and questions following the style of the World Café approach.

4.2 Outcomes

What data should be collected?

The participants sub-divided this question in terms of the two needs: Scientific data versus Awareness and Education.

Taking a scientific approach; mobile applications should be able to **count** and **categorise** the items found during a survey (according to material and object type). **GPS** co-ordinates as well as a description of the **location** (including habitat, vegetation and sediment) are important for these surveys. The data should be recorded as well as the **time** spent and **distance** travelled in order to determine survey effort. To ensure a robust and sound dataset, **registered users** conducting **randomised surveys** on weekly bases (depending on rainfall and storm events) are needed for **continual monitoring**. The resulting dataset should be **compatible** with existing databases and there should be some type of end-user portal (whether this is open access or restricted was not specified). This type of data collection serves a more formal approach and would be applicable to governmental and research establishments.

Taking an awareness and education approach; mobile applications should also count and categorise the items found during a survey. Again, there is need to describe the location, however monitoring periods could be extended to quarterly surveys. It was also suggested the mobile applications include a means of recording **brand items**, **spillages**, **industrial runoff** as well as provide an estimation to the amount of **recyclable items** from the items encountered. This type of data collection serves a more informal approach and would be applicable to smaller groups for **awareness** and **education** purposes.

What should be done with collected data?

First priority would be to capture and store the data collected in a **database**. This database should be **open access** through an **online portal** with a user-friendly interface. This database can be used to generate **visual products** such as heatmaps. These heatmaps would illustrate where clean-ups have

taken place and which waste items are occurring more frequently across a landscape. This would assist various waste management groups as they would have a better understanding of where to allocate their resources. Repeated surveys of high waste areas would help illustrate the progress of clean-up operations and management strategies. This is particularly important to **identify priority areas** when developing a waste management action plan.

These visualisations would also assist with **awareness campaigns** to promote public action and stimulate **behavioural changes** in consumers (especially if there is brand information associated with waste items discovered). This can be used to **market** the concepts of “Clean Cities” or “Most Improved Cities”. These visual products would need to be continually updated, with the possibility of having the Mobile Application itself updated based on the way the visual products are being used.

The database can be fed into **models** predicting/delineating the current baseline of waste throughout the environment. These models have to rely on **estimations** as it is not feasible to conduct research surveys throughout the environment. Therefore greater buy-in from the municipality and the general public with regards to conducting surveys using Mobile Applications would greatly assist the modelling by providing the much needed raw data.

How to ensure broad and timely coverage?

There needs to be a buy in from different sources.

Mobile Applications could make use of **tourists** to conduct surveys and give ratings (in terms of cleanliness) to popular destination points. Popular **group gatherings** and festivals could help promote the use of Mobile Applications (e.g. Park Run). It is necessary to understand the seasonality of the tourism industry and make use of peak tourist times.

The design of Mobile Applications could be simplified for use by **children** as an **educational tool**. This could be further enhanced with the use of **gamification** features (promote participation) and links to educational materials (promote awareness). This would enable schools to help organise large scale clean-ups while educating students.

There is the possibility of linking with various **local communities** along the coastline to gain buy-in in areas which are generally inaccessible. However such approaches would have to observe and respect local cultural and politic dynamics.

Partnerships with mobile companies as well as hardware and software **developers** could generate funds needed to establish a broadscale campaign. Examples of such companies include MTN, Virgin Mobile, Vodacom, Oracle, Google, ESRI, Microsoft and Dell.

Branding is necessary. A strong identity, accompanied with a strong slogan and message, would draw in attention and persuade action. This would be reinforced by a strong online presence; **social media** should be use to illustrate the actions of clean-up operations and management strategies. Partnering with existing events and media could reinforce the brand and drive an increase in participation.

Participants suggested making use of **divers and fishermen** as a means of ensuring coverage, however this would mean that the Mobile Applications would have to be usable in sometimes **harsh environments**.

How to leverage mapping for activation and educational purposes?

Participants felt that mapping the distribution of surveys and waste items would need to be done in a visually appealing manner to invoke interest. The design of the end-user interface would need to:

1. **Match** the Mobile Application (for **branding** identity).
2. Be adjusted according to the **target (age) group** (Mobile Application and end-user portal cannot be overly complex if being targeted towards children).
3. Link with **social media** sites (showcasing actions of local municipalities and clean-up operations).
4. Link with **educational** media sites (illustrating how waste is produced and moves through the environment as well as its negative effects).
5. Link with the **tourism** industry (identifying popular points of interest regarding the presence of waste and waste management and clean-up operations).
6. Be **open-access** (allowing anyone to freely access the data gathered).

If possible, a **pilot study** should be done using preliminary data in combination with existing datasets for greater detail. The lack of data could be used to identify areas requiring action.

4.3 Future directives

The most commonly addressed issue was the need to design Mobile Applications to suit the target audience to encourage participation. Data capturing using this platform should feed into an end-user portal to support waste research as well as further promote awareness and participation. There needs to be a clear identity and message with links to the social media pages of the organisations undertaking clean-up initiatives. Mobile Applications need to have strong links with the tourism industry and education sector. Many of these needs are already addressed and fulfilled through existing and developing Mobile Applications. The information acquired through this workshop (and others) assist developers in making slight alterations to their respective Mobile Applications in order to perfect the design for mass utilisation.

5. The African Marine Waste Network Workshop

Thursday 13th July

5.1 Background to the AMWN

The African Marine Waste Network was launched July 2016 for the 38 coastal and island states of Africa. It is the first network of its kind to focus on the prevention and mitigation of marine pollution in Africa. Delegates at the 2017 African Marine Waste Conference were asked to contribute to the design and mandate of the AMWN.

5.2 Workshop design

The workshop was designed as an “Africa Café”. Delegates were presented with three questions and asked to organise into approximately twenty groups of six people, debate answers and record them. After each question the group members were shuffled.

Questions:

1. What would success for the African Marine Waste Network look like? (The Network is performing).
2. What do you feel should be the priority focus topics of the AMNN as part of its initial efforts? What are the short-term priorities?
3. Aside from funding, what do you think is most needed to have a well-functioning AMWN?

5.3 Outcomes

How the AMWN should be structured and administered

Refining Network goals and objectives

The Network should have a **well-defined constitution, specific mission statements** and an **operational plan**. Connection and commitment to the central vision must be adhered to and objectives should be tailored to suit Africa. As landlocked countries also contribute to marine waste, it was suggested that the Network should expand to include inland countries of Africa. The Network should be **action-based** and **showcase evidence of real implementation**, change and quantifiable tangible success.

Suggested indications of large-scale success:

- Reduction in marine waste
- Reduction of waste in landfills
- Changes in consumer behaviour
- Social (re)engagement

Importantly, the Network should frame goals and objectives within the **“SMART” framework**, meaning that they should be Specific, Measurable, Achievable, Relevant and Time-bound.

Governance

The Network’s governance structure should be public knowledge, remain **open to comment** by stakeholders and be **representative** of the African continent. This should involve a committed, full-time team, manager and administrative board that should have a sustainable funding source. Some delegates suggested the AMWN should be a separate body from the Sustainable Seas Trust. The governance team should be **approachable** and operate from a clearly **designated head office** (hub), with potential to expand with satellite offices in various countries.

Stakeholders and Membership

The Network should involve and **actively engage all role players**, stakeholders and the entire value chain in marine debris issues, with equal representation from all sectors. Barriers to stakeholder participation should be identified and strategies to overcome the barrier should be designed. Organisations’ roles within the Network need to be clearly defined and understood, and their commitment should be clarified.

Membership should be active and have **robust representation** from African nations and stakeholders alike. Creating a network with **diverse and inclusive membership** is top priority. Network materials should be made available in a variety of **languages** to cater to this diversity and maintain inclusivity. Funding should be representative of all stakeholder groups and sectors. A strategy plan to increase membership and representation is crucial and once gained, the Network needs to ensure that membership is maintained.

Visibility, impact and brand

The AMWN needs to develop a **marketing plan** and brand that is **widely recognised** and shows the Network is a resource capable of influencing action. The brand should be **consistent** and embody the values of the Network to make them understandable and portrayed as something people will want to be a part of. The brand needs to appeal to and **encourage buy in** from a range of stakeholders, including civil society, government, academia and industry. This profile must be sustainable and effect

engagement and utilisation. The Network can **build credibility** and earn respect, trust and recognition by acting as a role model and gaining the endorsement of other high impact NGO's and international governance bodies.

The Network should have a strong **social media** presence and engage youth. Brand / **waste ambassadors** could be appointed to promote the Network, serve an example, and engage stakeholders. These ambassadors should be majority African representatives, charismatic and influential within local communities or nationally, for example; celebrities, musicians, entrepreneurs, and community champions. There should be an ambassador nominated from all levels of stakeholder representation in all parts of Africa.

What the AMWN should provide

Communication Channel

Above all the role of the AMWN is to act as a **communication channel for the dissemination of information** on marine waste and mobilisation of resources and funding in the African continent. The Network should facilitate a platform for and stimulate ongoing conservation, knowledge and idea sharing and motivation. The Network should act as an **independent broker** between stakeholders to close the gap in communication between relevant parties. Trust can be built between stakeholder groups through the Network. Communication should be ongoing and regular via, for example, newsletters and chat rooms. Through communication and the building of a database of past research and current projects, the Network will reduce replication and repetition among organisations and avoid "reinventing the wheel".

Provision of Resources

The AMWN should act as a resource and information centre and should be **open access**.

The following materials should be provided by the Network:

- Guides to Best Practice and preventative actions
- Practitioners repository: standard protocol documents to standardise methodology for data collection and data sampling strategies
- Local lessons and case studies
- Education and awareness materials and toolkits
- Repository of presentations and images
- Documents to increase policy, legislature and regulation awareness in varying African nations
- Accessible members list
- Online apps and databases
- Webinars
- Information on the circular economy

Pilot programs

The Network should conduct pilot programs and **projects on the ground** through members in each country of Africa and maintain a continued presence. Aside from achieving the goals of reducing waste mismanagement, this will also show that the Network is action-based, earn trust in African communities and attract international attention.

Education and Awareness

The Network should facilitate education and awareness at a school, household, municipality and family level. **Educational toolkits** and materials should be made available on the Network. Some delegates suggested environmental education should be established as a subject in African schools. Youth education is vital, but awareness **programs should target a range of ages** to include adults too.

Data Platform

The Network should provide a **centre for data collection and collation** and the **establishment of baseline data**. Waste and biodiversity hotspots and waste sources and sinks should be identified and focused on. Data gaps should be identified and publicised on the Network and a system to gather, monitor and evaluate data should be developed. **Standardised protocols** for data collection should be developed, promoted and made accessible online. A clear permissions document needs to be drawn up informing data contributors of their rights to ownership over data shared over the Network.

Economics and Industry, Policy and Governments

The Network should pay attention to gaining buy-in from government and industry. Recycling and upcycling should be promoted through the Network, along with circular economy principles to facilitate the creation of **economic value for waste**. The AMWN should **establish relationships** with inter-governmental bodies, for example, the Abidjan Convention, the Nairobi Convention, the African Union (AU), the Western Indian Ocean and Marine Science Association (WIOMSA) and the Southern African Development Community (SADC). **Policy should be discussed** on an African and international level, and infrastructure needs should be identified. Network strategy documents could share strategy documents and case studies to inform change in policy and industry.

5.4 Future directives

In summary:

- The AMWN must use its mandate to promote its mission in Africa in a manner that is relevant to Africa and “SMART”.
- The AMWN is a communication and resource hub for the dissemination of information, guides to best practice, educational toolkits, policy information and data collation while acting as an independent broker between stakeholder groups.
- The AMWN must be action-based and impactful.
- A brand must be developed for The Network.
- Cornerstones of the AMWN need to be based on transparency, diversity and inclusivity in every sphere of activity from governance to operations and stakeholder membership, continually building relationships and trust.
- AMWN needs to continually grow its membership and stakeholder involvement, by among other initiatives convening workshops, conferences and other events.

Suggested short-term goals for the next 12 months are:

- Growing the resource base to support the Network throughout the coastal and island states of Africa.
- Building up a strong team to meet Network requirements, beginning with a web administrator to run the internet portal and communicate with members.
- Design and have login portal for members up and running.
- Continue to promote the Network to gain new members.
- Develop the Network data portal in collaboration with SAEON and other stakeholders.
- Begin building up a resource base of information, interactive maps and educational toolkits.

- Complete the document “Strategy for Marine Waste: Guide to Action for Africa” and make it available on the Network early December 2017.

The homepage of the African Marine Waste Network is up and running at <https://africanwastenetwork.org.za/> - you can visit the webpage to join the Network.

6. Final Day Workshops

Thursday 13th July

Delegates split into four groups each focussing on a different topic, namely

1. Education
2. Data and Research
3. Industry
4. Tourism

and asked to consider their topic through the following three questions:

- Where are we now?
- Where do we want to get to?
- How do we get there?

6.1 Education

Workshop Design

The education workshop was well attended by approximately 50 attendees from NGO’s, industry and international organisations. The workshop was a platform to voice views on the current status of education in Africa and future directives to promote a more effective system.

General trends

There is currently a high level of individual action (NGO’s and organisations) regarding environmental education and awareness in Africa, however, there is no central platform where this information is available. This has resulted in a **lack of awareness of other currently existing projects** and gaps for needed future projects, as well as what has worked and what has failed.

It is important to link developed resources with current school curriculum as teachers are often hard pressed for time to develop extra programs on environmental education. In doing this, one must remember to examine what is taught provincially, nationally, and in public and private schools. It is also necessary to **develop standardised terminology** and vocabularies to enable uniformity in teaching throughout Africa.

The diverse audience educators cater for must be recognised. This means that teaching **resources must be adaptable** for a range of audiences (for example; adults, children, rural areas, affluent areas, scholars, university and Technicon students). The perceived **lack of support from government departments** makes implementing projects, spending time at schools and creating awareness difficult. This was raised as an issue in many African countries.

Future directives

Creating a **platform for educators to access resources** (worksheets, curriculum, and legislation) as well as tried and tested methods of successes and failures is an important step forward. Making this information readily available will result in less time and resources wasted on searching for this information. The AMWN could provide this platform. Hand-in-hand with this is the need to **share and collaborate** to avoid educators having to constantly “reinvent the wheel”. Funders should pay attention to proposals that feature sharing and collaboration efforts.

There is a need for a **unified voice and movement** to **increase government dialogue** and engagement. This voice could be unified and provided through the AMWN. Passionate **waste ambassadors** or community champions to help an area realise its potential. Coupled with this is the need to create pride, value and a spirit of environmental conservation and sustainability in community areas. This could be achieved through the creation of positive incentives, however the long term goal would be for civil society to actively want to maintain a clean environment for the sake of the environment itself, not because they will get something in return.

General **consumer awareness** around pollution and attitudes towards interventions such as recycling in Africa need to be understood better. It is important to base consumer education and awareness interventions on sound research and information, and link interventions in the consumer space to good understanding of the target audiences.

Considering the diverse audiences educators need to reach (country, province, city, village, culture, age, education and socio-economic status), it is important to **ensure the right combination of messages, methods and tools are available**. Coupled with this is realisation of the **multiple platforms** available to disseminate these messages and evaluation of those platforms for the best combination to reach the many specific audiences.

6.2 Data and Research

Workshop design

Delegates were asked

1. What is the African Marine Waste Network?
2. What research should the AMWN be working towards?
3. How will the AMWN accomplish this research?

Overview

The research component of the AMWN needs a clear and concise question with short and long-term aims and objectives that are obtainable in the future. While there was some debate as to what these should be, there is direct need for a **baseline showing the distribution of waste on land and in the ocean**. This baseline would help further the understanding of waste on the African continent and would provide the start for research focused towards long term waste monitoring and waste management strategies. The question is, how would the AMWN achieve this baseline?

There are various AMWN members who are able to contribute various expertise and resources towards achieving a baseline. A **list of these contributors** along with their potential and actual contributions to the AMWN is needed. This could be illustrated either in a formal document or on the website (possibly with the use of a mapping feature for added visualisation using varying colours or symbols to illustrate their contribution capacity).

Scope

Although the baseline will eventually encompass the entire African continent, there was some debate as to how this target should be approached. Should this project be initiated with a much **smaller pilot study**? This pilot study would test various methods until a consensus is reached on the most feasible methods given the expertise and resources available. The project can then be expanded to include the entire continent. Alternatively, should this project be initiated with a **rough analysis of the entire continent**? This would garner rough estimates for the entire continent early on and promote buy-in from potential stakeholders which could be later used to refine the methods for more accurate estimations. Or, is it possible to approach this project from both scales?

Traditionally, marine waste research has focused on the distribution of marine waste in the ocean and along the coastline. However, this baseline would need to include all aspects of marine waste from its production on land (**source**) to its eventual deposition in the ocean (**sink**). There is a relative lack of data when it comes to identifying waste sources and waste production thereof. It is important to develop a better understanding of waste across land and within the **riverine, sewerage and stormwater networks**, taking into account **temporary sinks** such as dumps, landfills, valleys, winds shadows, lakes, dams and reservoirs, swamps and estuaries. For example, it would be important to also consider the Great Lakes of Africa in tackling these waste issues. As this a global issue and not just limited to Africa, this baseline project is in a position to **develop innovative techniques and methodologies** to be used elsewhere in the world. Furthermore, the coastline would need to be reconsidered as a point where waste moves from land into the ocean as well as where waste from the ocean is re-deposited on land.

Data Acquisition

Data is needed in order to generate a baseline. Data acquisition will depend on the methods used. However, there is a plethora of **geographic and remote sensing data available** from trusted open-access databases online. These provide a quick start to any Geographic Information System (GIS) project. More specific or private interest data, such as survey, socio-economic and supply and other industrial data, is available from **restricted databases**, but access often requires formal requests or diplomatic persuasions. In some cases, there is already currently existing data for Africa, however it may not be accessible due to storage format. It is necessary to identify sources of these data and how states and governments might make it available across Africa. Understanding what data businesses and industries need to implement sustainable changes is also an important next step. Since different metrics are used worldwide, the data will need to undergo **standardisation** in order to be compatible internationally. Data acquisition and standardisation will most likely be a **costly** process.

The baseline model development will also require **new field data**. These data would either fill existing data gaps or help validate the developing model. Since the majority of African countries are middle to low income nations, many **lack the capacity** and resources to conduct and/or report data that would prove essential to developing the baseline. Field sampling could be a costly process; sampling equipment would be minimal cost but recruiting assistance and transportation will require **funding**.

It is possible to by-pass many of these expenses with the use of **Mobile Applications** to conduct field sampling, however this presents alternative advantages and disadvantages. Organisations and institutes across Africa could be asked by the AMWN to conduct field surveys of their local surroundings, which could also act to develop international relations and promote capacity building. Mobile Applications could be used for this, and are easier to understand and use than formal field survey methods. The accumulated data would be uploaded to an **open-access user-end portal** for

later extraction into the database for analyses. This would be an **administrative burden** and the resulting data would be vulnerable to **user error** (the data collection should possibly be restricted to trusted users only). Furthermore, the use of Mobile Applications for field surveys is **limited by smartphone capacity, internet availability and data usage** as well as the overall design of the Mobile Applications. There are numerous Mobile Applications targeted towards waste collection, each have a different purpose and collect data in a different manner (especially with regard to how they categorise waste). To standardise field survey methods, there will need to be a single all-encompassing Mobile Application which suites the criteria for this project given the limitations likely to occur across Africa.

Methodology

As discussed prior, there are a plethora of methods available to develop the baseline. Which methods to incorporate in developing the baseline will depend on the **scope** of the project, the **detail** of analysis, the **data available**, the capacity to acquire **new data** and the capacity to incorporate **assistance** from other organisations and institutions. The type of data collected depends on the research question asked; important considerations are where to measure, what to measure and what variables to include (e.g. rainfall, wind, road/rail networks municipal and service delivery, etc.).

Methods selected for use will need to be standardised. This would allow uniform methods to be **replicated** throughout Africa while affording other organisations and institutions the opportunity to assist with data acquisition and processing. Therefore methods must be clear, concise and with considerations given to technological and other restrictions. A **working group** should be set up to develop these standardised methods.

The AMWN could promote standardising methods of data collection by:

1. Providing a suggested **best method** to use for data collection.
2. If this method is not suitable, listing the **key components** a user's method should incorporate. (For example, gaining an understanding of sampling effort and area size sampled during beach clean ups is vital to reliably estimate plastic density).
3. Alternatively, users should provide **contact** details so that the Network can follow up with their project.

Capacity to create and **store incoming data in a centralised database** that is accessible to the various data processors is vital. This would be limited by server capacity and internet speed, potentially making data transfer and processing a timely exercise. Once formulated, this database would need to be linked with suitable GIS software to allow initial graphic representation and data processing. A formal model algorithm will need to be written and applied either in the GIS software or a secondary modelling/statistical program. These results will be fed back into the GIS software for final graphic processing and representation. **Capacity to publish** the results of the baseline development project is also important. It is also necessary to consider the targets of this research – who will have access to the data and who will use it?

Marketing

This baseline project has the potential to **promote interest and investment** from organisations, institutes and funding bodies which could provide needed resources to the AMWN's various projects. This would be of particular importance once visible products begin to develop. Attaching a **socio-economic aspect** to the developing data would promote these types of partnerships, bridging the gap between science and industry. **Cost versus environmental benefit analysis** would fill economic

research gaps and could be useful to market projects. For example, declining landscape aesthetic values would interest the tourism industry and declining water quality would interest health organisations. Furthermore, many large organisations have a **social responsibility** to their local communities in order to improve and empower their development. This baseline project can be “sold” as a means of locating and deploying clean-up and recycling operations; this would be of particular interest to the plastic manufacturers, distributors and retailers.

6.3 Industry

Workshop design

The workshop featured participants from various sectors including industry, science, education, waste disposal and the maritime sector (including Packaging SA, Two Ocean Aquarium, Fauna and Flora International, BP and Interwaste) engaging in debate.

General Trends

It is vital that industry has **awareness** of marine waste issues, however there was disagreement as to whether industry has this awareness or still lacks it. Members of industry attending the conference were willing to engage with waste issues, and also acknowledged that more needs to be done. **Insufficient communication** is a major problem and there is a need to develop sufficient communication platforms that are active and inclusive to improve the interface between industry and other stakeholders including NGOs and government. The Mining Indaba was discussed as an example of a successful platform for physical meetings and sharing intellectual capital. Proper communication can integrate fragmented initiatives to avoid duplication and promote best environmental practices. The **entire value chain should be targeted** and a voice provided for all. Focus should not be exclusively on packaging companies but should expand to include the maritime industry.

Although there were many industry members eager to engage, those demonstrating good practice are often seen as exceptions to the rule and there is often an overall **negative public perception** of industry. Other perceptions included a general **lack of trust** among many industry members as well as tendency among many to avoid **ownership of responsibility** of marine waste issues, and instead defer responsibility to others. There is an absence of compliance and **accountability** in industry due to lack of government infrastructure; participation in sustainable practices is voluntary instead of mandatory. Some argued competition within industry may paralyse environmental initiatives. What is industry doing to address this stigma and what should they do better? Industry players must a) acknowledge issues and b) work towards resolving issues. Proper transparent communication and the involvement of all stakeholders to provide intellectual support could be a solution to trust and responsibility issues.

Collaboration is integral to success and there should be a greater call to collaborate, aided by NGOs and governmental bodies. Industry needs to collaborate more openly. Africa currently lacks industry associations in many countries (for example, plastics, packaging, sewerage, used oil, etc.) Alliances and partnerships between sectors are also lacking and current public partnerships are too few and ineffectual. Industry should adopt a more top down approach with regard to alliances, as opposed to horizontal alliances or within the same groups. The Global Plastics Alliance’s Declaration on Marine Litter has identified various consumer groups brand owners and retailers to collaborate with finding solutions to marine litter.

Knowledge gaps were identified in technology and data. Some advanced **technologies** are not available in South Africa but other countries have solutions. Is it unrealistic to hold South Africa to the same level of packaging standards without the latest technology? Global effort and commitment by

industry to innovate smart and intelligent designs are important solutions if plastic consumption cannot be reduced. With regard to **data**, baseline estimates are necessary as this data enables the identification of locations that are priority focus. Industry needs to start working on finding this information and identify waste “hotspots” or “pressure points”. An additional gap exists in the transfer of information between industrial sectors and educational groups. Sending **questionnaires** to industry was suggested as a means to gather this information.

Recycling levels in South Africa are too low and the value of waste is not entirely realised. Waste must be better identified and portrayed as an **economic opportunity** with better **incentives** for recycling as part of the circular economy. Linking **funding** sources to those that need it is important. Prospective benefactors of initiatives that provide a centre for mentorship for startups (for example; initiatives of ABSA) should be made aware of them. Current waste management is not adequate and better **infrastructure** is needed. At the same time, recycling value is not at the desired level due to **technological deficits**. Targets must be set with regard to recycling. Many delegates felt it is difficult to engage governments in Africa and there was a call for **government lobbying** by industry. Waste companies should play an important role both as ensuring proper recycling takes place, and as the link between industry and other key players such as government and municipalities. A master plan would be useful to gain government backing and funding.

There is a need for revised **master plans** and road maps to plan goals and future actions in the form of tangible outcomes within specific timeframes, especially in Africa. There must be better coordination and structure to identify stakeholder groups industry should engage to effect action. Marketing plans are necessary to market industry’s solutions to the general public to increase reach and buy in. Without action, waste problems will worsen with a growing population. The need for immediate action means we must innovate while we implement.

6.4 Tourism

Outcomes

Where are we now?

The main outcome was that the current position of tourism with regards to waste management and litter is unknown. We do know that the tourism industry is not often exposed to or educated on the environmental impacts of waste. This is an important starting point. There are **few data** examining this issue from an economic approach or demonstrating the contribution of tourism to marine waste. On the other hand, tourism can be a motivating factor for waste removal from the environment, although the extent to which this is currently the case has not been quantified.

There is confusion and lack of knowledge on **what is being taught** and where is it being taught. Is waste management being taught in tourism modules? One could start by identifying universities that teach tourism and then determine if this includes waste management, environmental sustainability and eco-tourism. One could identify whether any schools have tourism in their curriculum and if they cover these three topics. It is also important to identify the number tourism organisations in Africa and **showcase** those that are practising eco-tourism or are involved in environmental initiatives, like beach clean-ups.

Another issue is the current **lack of uniform approach** for individual businesses. Individual lodges and hotels may have waste management practices in place that other businesses can learn from. Should mandatory recycling be included in business plans? Most companies want to keep their area clean, but they often collect the waste and remove it without considering where it goes next.

Where do we want to go?

Businesses want to be recognised. Companies and tourism destinations could receive **promotion and endorsement** through the AMWN, lauding them as sustainable and environmentally friendly, thus providing an incentive for others to become so. Waste affects the **aesthetic appeal** of tourist destinations and tourists often post reviews and comments online about rubbish, which discourages others from visiting the same locations. The AMWN could be a platform for businesses to get positive **feedback from customers**, due to a company's focus on reducing waste and promoting sustainability. Ideally, all citizens would be educated on the marine waste issue, and tourism can fill this role with their customers. Newcomers to the tourism industry and those already part of the industry should be educated on the issue so they can pass on information to customers.

The goal is to have a tourism industry in 5 to 10 years that plays its role in waste minimisation and acts as a role model to other industries. Key role players are not limited to the hotel industry, but includes dive operators, fishing charters and beach goers. All these stakeholders need to be educated. There should be a unified voice for the industry on waste management issues. The tourism industry could be an excellent platform to promote waste awareness.

How do we get there?

- Education on marine waste should occur more within the tourism industry. This could be through involvement in **public awareness campaigns** like beach clean-ups or through **educational programmes** within the organisation and industry. A key strategy would be to educate businesses on how litter may affect tourism and show the benefits of managing it.
- Waste management by the tourism industry should be **enforced** and policies standardised.
- The amount of waste the tourism industry generates should be **quantified**.
- Tourist establishments need to have a **Key Performance Indicator** (KPI) that includes responsible waste management: sustainability and waste minimisation should be a minimum requirement in order to be a 5 star or any star hotel. The International Organization for Standardisation (ISO) could be included.
- A platform should be created, similar in format to Trip Advisor, that gives some type of grading or **certificate for outstanding waste minimisation** and management.
- **Practical methods** need to be used to communicate the message of sustainability. For example, Nelson Mandela Bay has three beaches with Blue Flag status which prohibits people from bringing bottles and certain items to the beach.
- There should be more **advertising** by tourism companies to stop littering.
- Excellence in waste management efforts by tourism companies should be recognised and rewarded. **Showcase** establishments with the best practice and reward with prizes or other **incentives**.

7. Concluding Statements

The 2017 African Marine Waste Conference brought together delegates and experts from Africa as well as from other continents. The delegates represented a variety of sectors present to discuss and debate marine waste issues in Africa. The conference is set to meet every two years, the next event being in 2019.

Two major products of the conference will be the continued development and expansion of the African Marine Waste Network and the document "Strategy for Marine Waste: Guide to Action for Africa", due to be made available on the Network in December.

If you would like to contribute further to "Strategy for Marine Waste: Guide to Action for Africa" please email a.ribbink@sst.org.za. You can find out more about the AMWN and join the Network at <https://africanwastenetwork.org.za/>.