
A warm welcome from the host

It is a real pleasure to welcome you to the inaugural conference of the African Marine Waste Network. Sincere thanks to the many of you have travelled a long way to join us so that we might collectively develop a strategy to reduce and then stop the amount of solid waste that is entering the coastal waters of Africa, from land and the sea. You are encouraged to listen to the wonderful speakers and to participate in the discussion groups and workshops of this conference. It is a networking opportunity where you can make new contacts and share your ideas.

We wish you an enjoyable, stimulating time at the conference while forming recommendations on the actions that we in Africa need to take to significantly improve the way in which waste is managed and the potential of the circular economy is realized. We would also love to have your guidance on how the African Marine Waste Network should serve your needs.

The primary product of the conference will be the publication of the *“Strategy for Marine Waste: Guide to Action for Africa”* which would benefit enormously from your contributions at the conference and hopefully afterwards too you will help build the contents as an author.

Once again: Thank you for joining us.

Tony Ribbink on behalf of the Sustainable Seas Trust and the African Marine Waste Network team.



Sustainable Seas Trust has pleasure in thanking the organizations whose logos are depicted here for their support for the inaugural African Marine Waste Conference and the developing “Marine Waste Strategy: Guide to Action for Africa.”



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Daily Programmes

Sunday 9th July: Yacht Function and Early Registration

10:00 – 14:00	Launch of the Yacht Based Education and Research Programme at Algoa Bay Yacht Club <i>Sylvia Earle (Mission Blue/National Geographic)</i>
15:30 – 16:00	Exhibitors to Set up
16:30 – 19:30	Early Registration and Icebreaker at Feather Market Hall

Overview - The general structure of the programme follows this pattern:

Summary of daily programmes			
Monday 10 July	Tuesday 11 July	Wednesday 12 July	Thursday 13 July
Official opening plus keynote & plenary oral presentations	Keynote & plenary oral presentations	Keynote & plenary oral presentations	Workshops
Networking break, poster break and refreshments – 40 min			
Keynote & plenary oral presentations.	Keynote & plenary oral presentations	Plenary oral presentation	Workshops
Panel discussion	Panel discussion	Plenary discussion group	Workshops
Networking and lunch break – 70 min			
Oral presentations in 2 parallel sessions	Oral presentations in 2 parallel sessions	Oral presentations in 4 parallel sessions	Workshops

Notes:

Other than Registration on Day1, the daily schedule is from 8:30 to 17:00 each day, but the times that the breaks start vary on different days –

Please consult the detailed programme below for daily times

Day 1: Monday 10th July

07:30 – 08:30	Registration	
Morning Plenary Sessions		
08:30 – 09:00	Official Opening of the Conference <i>Deputy Minister of Environmental Affairs, South Africa</i>	
09:00 – 9:40	Keynote Presentation “The Economic and Environmental Impacts of Marine Pollution: Solutions and Opportunities” <i>Sylvia Earle (Mission Blue/National Geographic)</i>	
9:40 – 10:10	“Waste management in Africa and the Growing Case for Marine Litter” <i>Linda Godfrey (Council for Industrial and Scientific Research)</i>	
10:10 – 10:40	“The International Coastal Cleanup: three decades of citizen action for the ocean” <i>Allison Schutes (Ocean Conservancy)</i>	
10:40 – 11:20	NETWORKING, POSTER BREAK & REFRESHMENTS – 40 min	
11:20 – 12:00	Keynote Presentation “Education – the Future of Waste Management” <i>Peter Murphy (National Oceanic and Atmospheric Administration, USA)</i>	
12:00 – 12:30	“Creating Conditions for Innovation and Collaboration” <i>Yannick Beaudoin (GRID-Arendal); Kristian Teleki (Prince of Wales Foundation, International Sustainability Unit)</i>	
12:30 – 13:00	Panel Discussion <i>Panelist: All Speakers from Keynote and Plenary Sessions</i>	
13:00 – 14:10	NETWORKING AND LUNCH – 70 min	
14:10 – 15:10	<i>Parallel session 1: Plastic and Environmental Science</i>	<i>Parallel session 2: Microplastics</i>
14:10 – 14:30	Hindrik Bouwman Marine Debris on Remote Islands in the Indian Ocean Contains Organic and Inorganic Pollutants	Matthew William Coote Microplastics Make Fish Anally Retentive
14:30 – 14:50	Nicolene Chapman Building Scientific Knowledge and Capacity through Partnerships: The Ocean Stewards Initiative	David Glassom The Effects of Microplastic Ingestion on the Growth and Survival of Juvenile Glassfish, <i>Ambassis dussumieri</i>
14:50 – 15:10	Takunda Chitaka Estimating Plastic Leakage into The Environment: the South African Case	Travis Kunnen Automated Analysis of Fluorescent Microplastic Fibres
15:10 – 15:50	NETWORKING AND REFRESHMENTS – 40 min	
15:50 – 16:50	<i>Parallel session 1: Plastic and Environmental Science</i>	<i>Parallel session 2: Microplastics Workshop</i>
15:50 – 16:10	Gan Moodley The Effect of Near-future Ocean Warming and Acidification on the Ingestion Rate of Microplastic Fibres in <i>Perna perna</i>	Microplastics Workshop Lead by Holly Nel
16:10 – 16:30	Karin Minnaar Plastic Debris Along the Shores of Three Remote Islands in the Western Indian Ocean	
16:30 – 16:50	Lorien Pichegru Seabirds and Plastic Debris	
EVENING ACTIVITIES – Gamestorming Session at the Feather Market Hall 17:00 – 18:30 (Drinks and Snacks provided)		

Day 2: Tuesday 11th July

08:00 – 08:20	Registration	
Morning Plenary Sessions		
08:20 – 09:00	Keynote Presentation “Plastic Waste Inputs from Land into the Ocean; we can come together to solve this global problem.” <i>Jenna Jambeck (Georgia University, USA)</i>	
09:00 – 9:40	“Data and Research – A case study from Mozambique” <i>Pippa Howard and Jonathan Knox (Fauna and Flora International, Cambridge University, UK)</i>	
9:40 – 10:10	“Large scale monitoring design for marine debris - developing robust and flexible approach to support policy responses” <i>Chris Wilcox and Denise Hardesty (Commonwealth Scientific and Industrial Research Organisation, Australia)</i>	
10:10 – 10:40	“Let’s Do It! World Cleanup Day 2018 & Strategy for Africa” <i>Marietta Hopley (Let’s Do It! World)</i>	
10:40 – 11:10	NETWORKING, POSTER BREAK & REFRESHMENTS – 30 min	
11:10 – 11:50	Keynote Presentation “Marine Litter in the Abidjan Convention” <i>Abou Bamba (Abidjan Convention & United Nations Environment)</i>	
11:50 - 12:20	“Managing Marine Waste in Western Indian Ocean” <i>Julius Francis (Western Indian Ocean Marine Science Association & Nairobi Convention)</i>	
12:20 – 12:50	“Marine Plastic Debris Management in Indonesia” <i>Deputy Minister Safri Burhanuddin, Republic of Indonesia</i>	
12:50 – 13:10	Panel Discussion <i>Panelists: All Speakers from Keynote and Plenary Sessions</i>	
13:10 – 14:10	NETWORKING AND LUNCH – 60 min	
14:10 – 15:10	<i>Parallel session 1: Education and Awareness</i>	<i>Parallel session 2: Data & Research Workshop</i>
14:10 – 14:30	Deborah Robertson-Andersson Booms, Bins and Bags: The B3 Solution to the BIGA Problem!	Part 1: Data and research workshops Led by Sustainable Seas Trust (SST) and Fauna and Flora International (FFI)
14:30 – 14:50	John Kieser 20 Years of Citizen Science. Looking at the International Coastal Cleanup as a Platform for Raising Awareness.	
14:50 – 15:10	Masa Iwata The Influence of the Ocean Garbage on Old Fourlegs, the Coelacanth	
15:10 – 15:50	NETWORKING AND REFRESHMENTS – 40 min	
15:50 – 16:50	<i>Parallel session 1: Education and Awareness</i>	Part 2: Data and research workshops Led by Sustainable Seas Trust (SST) and Fauna and Flora International (FFI)
15:50 – 16:10	Kaveera Singh Digital Conservation: Scientists Portal to Connecting with the Public?	
16:10 – 16:30	Steve Cohen Innovation and Urgency – The Cornerstones of a Coastal City Response to the Plastic Pollution Crisis	
16:30 – 16:50	Henry Roman Capacity Building in the Waste Sector in South Africa	
GALA DINNER at Radisson Blu – BEGINS AT 19:00		

Day 3: Wednesday 12th July

08:00 – 08:30	Registration			
Morning Plenary Sessions				
08:30 – 09:10	Keynote Presentation “Africa, a Global Priority for Solutions for Marine Litter: No Time to Waste” <i>Karl Foerster (Executive Director, Plastics Europe)</i>			
09:10 – 9:40	“Actions Industry should be taking in Africa: Time for Innovation and Action!” <i>Chris Whyte (Managing Director, Use-it)</i>			
9:40 – 10:10	“Plastics and Packaging: Is it all bad?” <i>Charles Muller (Executive Director, Packaging SA)</i>			
10:10 – 10:40	“The Role of Technology in Cleaning Up” <i>Chandru Wadhvani (Joint Managing Director, Extrupet (Pty) Ltd.)</i>			
10:40 – 11:20	NETWORKING, POSTER BREAK & REFRESHMENTS – 40 min			
11:20 – 11:50	“Circular economy employment and SME development in southern Africa” <i>Thabo Magomola (Transaction Advisor, Waste Management Bureau)</i>			
11:50 – 12:20	“Youth in Recycling – Our Recycling Journey” <i>Zwelibanzi Mnguni (Destination Green)</i>			
12:20 – 13:00	Panel Discussion: Plastics and Consumers <i>Panelists: Mandy Naude (CEO, POLYCO), Adri Sprangenberg (Director, PSPC), Oscar Baruffa (Data and Strategic Projects, PETCO)</i>			
13:00 – 14:10	NETWORKING AND LUNCH – 70 min			
14:10 – 15:10	<i>Parallel session 1: Challenges & solutions for tourism & municipalities</i>	<i>Parallel session 2: Circular economy & economics enterprises</i>	<i>Parallel session 3: Economic imperative & social responsibilities of the plastic industry</i>	<i>Parallel session 4: Mobile Applications Workshop</i>
14:10 – 14:30	Mandlakazi Skefile Waste not, want not: Economic opportunities in Waste management	Hayley McLellan Rethink the Bag – For a Plastic Shopping Bag Free South Africa	Steve Trott Community based waste management and recycling enterprises. Kenya	Mobile Applications Workshop – Lead by Jaka Kranjc and Jenna Jambeck
14:30 – 14:50	Peter Myles Corporate Responsibility in Reducing Ocean Plastic Waste	Motshabi Sibeko Environmental Analysis of Pneumatic Tyres	Mark Gerrard The Blue Crew – generating livelihood support through a cleaner marine environment	
14:50 – 15:10	Weziwe Busakwe Plastic Waste and tourism in the E Cape	Neville Emslie Conversion of Waste Plastic into Chemicals	Janine Basson Understanding of the role of consumers in transitioning to a circular economy in SA	
15:10 – 15:50	NETWORKING AND REFRESHMENTS – 40 min			
15:50 – 16:50	<i>Parallel session 1: Challenges and solutions for tourism and municipalities</i>	<i>Parallel session 2: Circular economy and economics enterprises</i>	<i>Parallel session 3: Economic imperative & social responsibilities of the plastic industry</i>	<i>Parallel session 4: Mobile Applications Workshop</i>
15:50 – 16:10	Al Karrani Challenges and Innovation in Cleaning Dubai Waterways	Jaisheila Rajput Beyond Recycling to New Viable Source Materials	Annabe’ Pretorius Plastics Recycling – the Only Solution?	Mobile Applications Workshop – Lead by Jaka Kranjc and Jenna Jambeck
16:10 – 16:30	Heather Troutman Waste Valorization as a Strategy to Sustainably Manage Plastic Wastes In Developing Economies	Maya Jacob John Development of bio-based materials from agricultural waste residues	Oscar Baruffa Doing more with less; how data-driven decision-making can maximise the impact of waste minimisation efforts	
16:30 – 16:50	Michael Melato Environmental knowledge, attitudes and perceptions of Port of Cape Town users as they pertain to waste and pollution management	Sudhakar Muniyasamy Environmental Biodegradation of bio- based materials in biotic conditions	John Kieser Projects Responding to the Issue of Marine Waste	
EVENING ACTIVITIES – Gamestorming Session at the Feather Market Hall 17:00 – 18:30 (Drinks and Snacks provided)				

Day 4: Thursday 13th July – Contribute to the Strategy for Africa

08:00 – 08:30	Registration
08:30 – 09:00	<p style="text-align: center;">Conference Workshop Including Why Africa-Solutions by Africa-an ideas and action incubator Sudhakar Muniyasamy Introduction and Outline</p> <p style="text-align: center;"><i>Your input at these workshops will go toward developing the “Strategy for Marine Waste: Guide to Action for Africa”, to be published in December 2017. A day of stimulation, innovation and action, this is an opportunity for you to voice your ideas for change.</i></p> <p style="text-align: center;"><i>See supporting documents provided at the conference for more information.</i></p>
09:00 – 10:30	Conference Workshop First round of breakaway sessions
10:30 – 11:00	NETWORKING, POSTER BREAK & REFRESHMENTS – 30 min
11:00 – 13:00	Conference Workshop Second round of breakaway sessions
13:00 – 14:00	NETWORKING AND LUNCH – 60 min
14:00 – 15:00	Conference Workshop Report Back
CLOSING OF CONFERENCE	

Poster Presentations

Name of Author	Poster Title
Babatunde Adeleke	Crabs, heavy metals and near future ocean acidification – What do we know?
Deborah Robertson-Andersson	Microplastics
Ilana Engelbrecht	Identification of microplastics in penguin guano
Keshia Govender	The efficacy of various filter media in removing copper from treated seawater
Kingsley Ebomah	Antibiotic Susceptibility Profiles of <i>E.coli</i> from Nahoon beach
Lorien Pichegru	Beach clean-ups and recycling initiatives
Oladimeji Ilawaye	Microplastics In the Ocean: The Emerging Threats
Samantha Infante	A Biodiversity Assessment of Chaka’s Rock and Surrounds
Sudhakar Muniyasamy	Triggered biodegradation of Linear Low-Density poly(ethylene) (LLDPE) Films containing Bio-based Pro-oxidant/Pro-degradant Additives for Ecological Applications
Wesley Dalton	The uptake of microplastics in the caridean shrimp

List of Presenters and Abstracts (mostly in alpha order, by surname)

Adel Abdulla Al Karrani is an Environmental Science and Sustainability graduate, with a diploma in health and science. A member of Dubai National Marine Pollution Crisis Team. Head of Waterways cleaning unit in Dubai Municipality.



Challenges and innovation in cleaning operations of Dubai Waterways. Al Karrani A, Al Ali Y (Wednesday 12 July, Parallel Session 1) Dubai Municipality is the largest governmental institution in terms of services rendered and projects executed with more than 15 000 employees. Thus, it is the leading driver of growth and evolution of the Emirate of Dubai which caters for 2.4 million residents. With yearly 14 million tourists accompanied by an annual growth of 9%, Dubai welcomes 4.2% of its total tourists by sea and is also a commercial hub with an annual foreign sea trade of AED.0.97 trillion. The present harbours in Dubai and its surroundings are being transformed from heavy industrial/commercial areas to revitalized, multipurpose waterfronts. Changes in business patterns, lifestyles and recreation have forced governing bodies to rethink land and people utilization along the waterfront. Rundown buildings and dock areas are now finding themselves being modernized by trade mark buildings, hotels, boutiques and restaurants, along the waterfront, tall ships, trade boats, luxury boats, floating restaurant and water taxis. Recent inclusion of a business channel with the man-made Dubai Canal has doubled the length of creek from 14 km to approximately 32 km, which has added new challenges and responsibilities that need to be strengthened to meet the required standards of Dubai. Dubai Municipality ensures elimination of floating solid waste, oil and chemical spill and handling of crisis situations (burning or sunken ships, oil spills, dead fish etc.) which also plays a vital role in keeping our ships moving in terms of people and environment. To achieve that, it has established a marine fleet operating in Dubai water channels (including land craft, hydraulic skimmers, boats etc.) that has paved way to cleaning and maintaining healthier marine life.

Adeleke Babatunde Recently completed MSc in marine biology from University of KwaZulu-Natal, Westville Campus and about to register for PhD in the same school. MSc thesis was on combined effects of ocean acidification and heavy metal concentrations in Sand Bubbler Crab from Durban Harbour, Richards Bay Harbour and Mlalazi Estuary.



Crabs, heavy metals and near future ocean acidification – What do we know? A. Babatunde. (Poster Presentation) Durban Harbour, Richards Bay Harbour and Mlalazi estuary are part of KwaZulu-Natal estuarine systems. Durban and Richards Bay, like most estuarine harbours, are persistently subjected to anthropogenic activities (intense urbanization and industrialization) as well as expansion of commercial shipping resulting in bioaccumulation of pollutants. The uMlalazi estuary contrarily is situated in a coastal nature reserve; the watershed lies in a lower population density area and consequently is less prone to anthropogenic effects. Crabs, as both predator and prey, form an important component of marine food webs. They are mostly benthic with restricted mobility and are especially sensitive to pollution because they reside on the substrate where chemical contaminants accumulate. Crabs accumulate pollutants including metals, resulting in biological alterations from molecular to tissue level depending on pollutant concentrations and duration of exposure. Pollutants may therefore be bioaccumulated in crabs resulting in several orders of magnitude higher than those of the surrounding water, with further biomagnification in the food chain to higher trophic levels, including human consumers. The background levels of heavy metals (Pb, Cd, Zn and Cu) in tissues (hepatopancreas, gills, and exoskeleton) of sand bubbler crabs (*Dotilla fenestrata*), sediments and water were investigated through nitric acid digestion. Metal analysis was done using Inductive Coupled Plasma Mass Spectrometry (ICP-MS). Crabs were also exposed to varying concentrations of Cd and Pb under near-future pH for 96 hours to replicate heavy metal uptake under predicted 2050 levels of ocean acidification. Crabs were dissected after 96 hours exposure to determine heavy metal bioaccumulation in tissues as a result of interactive reaction of metal solutions and pH. Results obtained from this study will contribute to our understanding of how crabs respond to heavy metal uptake in the context of global climate change, more specifically with respect to near-future ocean acidification.

Abou Bamba is the Regional Coordinator of the Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West, Central and Southern African Region (Abidjan Convention, 1981). Before joining UNEP, he has served as Coordinator for the Africa Region of the Secretariat of the Ramsar Convention on Wetlands, Gland, Switzerland, and has been Technical Advisor at the World Bank / International Bank for Reconstruction and Development (IBRD) and Coordinator of the Network for Environment and Sustainable Development in Africa at the African Development Bank (AfDB). His qualifications and interests include Port and Maritime administration, integrated oceans management, sustainable management and political economy of the environment.



Marine litter in the Abidjan convention. Bamba A. (*Tuesday 11 July, Keynote Presentation*) Marine litter, or marine debris, is human-based waste ending up in oceans. The largest component of marine litter is plastic, one of the least biodegradable materials on earth. Every piece of non-biodegradable material fabricated as far as 30 years ago still exists, whether it's recycled, broken down into 1 to 5 mm long pieces or discarded as is. And each year, about 9.5 million tons of plastic ends up in oceans from landfills. Not surprisingly, the phenomenon not only affects marine species but also presents a health hazard for humans. Marine litter is more dangerous than commonly perceived. Beyond its impacts on health, the phenomenon raises serious concerns about food security with populations of consumed species decreasing heavily over these past few years. In the Abidjan Convention Area, one of several challenges with marine litter is data collection, which causes a serious delay in reporting accurately on the issue. It is indeed impossible to assess the exact amount of waste sitting along the coast mainly due to lack of national means. Although it is unclear how many tons of marine litter lie on Africa's western coastline, we know that local communities lack awareness regarding waste-dumping and often use oceans and wetlands as dump sites. At regional level, the convention's contracting parties adopted protocols aiming at joining synergies to address the problem. The protocol for the protection and development of marine and coastal environment from Land Based Source Activities, adopted in 2012, makes provisions for reduction, mitigation and control of pollution from land based activities. Given that marine litter is one of the heaviest forms of pollution, it became critical for the convention to act. Now in its active phase, the convention is seeking to implement protocols through regional initiatives. An important step forward is the development of the African Marine Waste Network and its projects. The Abidjan Convention is developing an MOU with AMWN so that collectively our impact can be great.

Oscar Baruffa has been working in the broad field of sustainability for the past decade, having graduated with a Mechanical Engineering Degree at the University of Pretoria and later a MSc in Building Services Engineering Management from Brunel University, West London. Oscar's career has taken him from designing low-carbon buildings across the UK, to conducting sustainability audits across the mining, banking, manufacturing, and other sectors in South Africa, to running the national recycling programme at PETCO for 3 years. More recently, his focus has been on enhancing PETCO's data capabilities.



Doing more with less: how data-driven decision-making can maximise the impact of waste minimisation efforts using limited resources. Baruffa O. (*Wednesday 12 July, Parallel Session 3*) Managing inland waste is a priority for combatting marine pollution. With growing populations and rising living standards, Africa will have an ever-increasing amount of packaging, and municipalities play a key role in crafting long-term sustainable solutions. Using South African municipalities as an example, we'll investigate why we need to recognise local conditions when setting national plans. We'll also cover how utilising open data can help pinpoint interventions to make maximum impact with limited resources. Open data needs advocates at every level. Africa has suffered from a lack of data collection and processing at national and sub-national levels. Many programmes are currently in progress to improve the level of data accessibility across the continent. South Africa's own efforts are bearing fruit in the form of demographic information and municipal finance information, along with schools, post office locations, river data and public transport stops. These datasets come from Government entities, NGOs and private enterprise. Using these as available sources of information, we'll consider how this will affect planning for waste minimisation efforts, programmes and policies. Sharing data across organisations is more difficult than it first appears. With open data and data-driven decision making, it is necessary to share

information in a way that maintains consistency and confidentiality. It also becomes necessary to continuously improve the skillsets of data practitioners as professionals. Utilising the South African context as a case study, we can spark a conversation about other such efforts in Africa. Many of the topics of this presentation are being covered for the first time in this context, and can be replicated elsewhere, taking local conditions to account. As we develop networks for problem-solving on the continent, we should seek to establish pan-African networks to deal with the ever more valuable aspects that data collection, sharing and analysis can bring to combatting marine waste.

Janine Basson. Janine's career is an ongoing pledge towards the protection and health of our oceans – from her work with the Namibian government as an intertidal biologist, to furthering the sustainable seafood movement in South Africa through the WWF-SASSI Programme, to her current work with PETCO, the South African PET Plastic Recycling Company. Focused on growing PET plastic recycling in South Africa, her vision is that South Africans understand that PET plastic is valuable, recyclable and safe to use, and use their influence to drive positive recycling behaviour through demanding products containing recycled content



Towards an understanding of the role of consumers in transitioning to a circular economy in South Africa. Basson J. (Wednesday 12 July, Parallel Session 3) A circular economy is one that builds economic, natural and social capital as opposed to the current “take, make and dispose” extractive industrial model that we know cannot continue indefinitely. It is restorative and regenerative by design, relying on system-wide innovation. In a recycling economy specifically, consumers are significant role-players and must be adequately capacitated and empowered to understand the potential and value of recycling and the products made from recycled matter. Furthermore, in order to transition to a circular economy, consumers will need to start using their influence and buying power to drive positive recycling behaviour up the value chain through demanding products containing recycled content. However, behaviour change hinges on awareness being raised amongst consumers. Here, we present the case for consumers as a key driver in transitioning to a circular economy in South Africa. Using PETCO as an example, we demonstrate the need for an explicit understanding of the system within which we operate (with articulated assumptions), and we present findings from South Africa's first broad-based research into consumer recycling behaviour. We also present recommendations on how to apply these learnings into other African contexts and the design principles that could guide future consumer campaigns beyond South Africa.

Yannick Beaudoin. Chief Scientist at GRID-Arendal, a center collaborating with UNEP and the UN Economic Commission for Africa in Norway. Yannick works to apply new economic thinking, a science of change and participatory social processes across GRID-Arendal's areas of focus that include: adaptation to uncertain climate futures in polar and mountain regions; embedding local, traditional and indigenous knowledge in policy-, decision- and choice-making; enabling conversations and innovation for new development and economic paradigms; promoting a transition to a sustainable relationship between society and the ocean. Activities involve working with countries, local communities, industry, academia and other actors to design societal systems, processes and approaches that increase human well-being while preserving and enhancing nature. Most recently, Yannick has been facilitating conversations with central bankers in Africa, highlighting various examples of post-GDP economics and post-extractivistic development paradigms.



Co-presenter **Kristian Teleki** is currently the Senior Marine Adviser to the Prince of Wales's International Sustainability Unit and the Director of Engagement for Ocean Unite. Kristian was most recently the Director of Global Engagement for the Global Ocean Commission. Prior to this he was Vice President of SeaWeb, responsible for its sustainable markets, science, and Asia Pacific programmes. He has also been the Director of the International Coral Reef Action Network and has led the Marine Programme at UNEP-WCMC. Kristian is on the boards of several environmental, development and



social initiatives, and the Editorial Board of Aquatic Conservation. He has degrees from the University of California, Santa Barbara and Cambridge University.

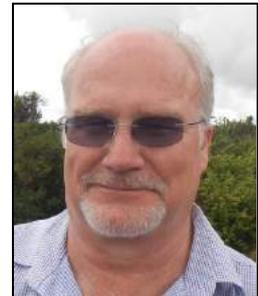
Creating conditions for innovation and collaboration. Yannick Beaudoin and Kristian Teleki will co-present workshop sessions (*Hosted by GRID-Arendal and the Prince of Wales's International Sustainability Unit (ISU)*)

Discussion Session: Why Africa? (*Monday 10 July, Plenary Presentation*)

Conference Workshop: Solutions by Africa – an Ideas and Actions Incubator. (*Thursday July 13*)

Background and purpose of sessions. The Africa Marine Waste Conference presents a unique opportunity to bring together diverse stakeholders from science, industry, academia, government and other interested groups and individuals from both Africa and the global community to look specifically at the issue of marine litter in an African context. Given the importance of the marine environment as a source of livelihoods, food security and economic development in African coastal and island countries; and the potential for these opportunities to be undermined by pollution, it is critical that the issue of marine litter is explored, understood and mitigated as soon as possible. These sessions aim to provide a platform from which innovation and collaboration can be explored and concrete actions and solutions can be identified. While the first session aims to highlight the important role of Africa in the global marine litter discussion, the second session explores African relevant solutions for tackling this issue. Both sessions will seek to inform the development of future regional or national Action Plans for Marine Litter. Further information will be provided at the conference.

Henk (Hindrik) Bouwman PhD, Professor in Zoology, at the North-West University, Potchefstroom, South Africa. I am active in ecotoxicology, marine debris research, and bird ecology. My marine work concentrates on the Indian Ocean.



Marine debris on remote islands in the Indian Ocean contains organic and inorganic pollutants. Bouwman H. (*Monday 10 July, Parallel Session 1*). Plastic marine debris in oceans is attracting scientific attention due to the large amounts involved and the threats it may pose. Floating plastics can travel long distances and can end up on remote island beaches. Chemical pollutants can be taken up by plastics, which may therefore facilitate long range transport of these pollutants. We sampled plastics and coral matrices on St Brandon's Rock (SBR) in the Indian Ocean, 450 km north of Mauritius. Brand names on the debris indicate origin from the East Indies and northern Indian Ocean. To reach SBR, the debris had to travel thousands of kilometres. We predicted that abrasion, UV, and biological action would cause the associated pollutants in the plastics to become available for uptake where the debris becomes beached. We analysed the samples for a variety of POPs, other pollutants, and mercury using GC-MS/MS, GC-HRMS, and HPLC with ESI-MS/MS. Mercury was analysed using AMA254. Chlorinated and fluorinated organic pollutants and mercury occurred in much higher concentrations in plastics compared with the coralline matrices. The composition and concentrations of the various pollutants differed greatly within and between sample classes. The heterogeneity of composition and concentrations of pollutants in the coralline samples indicate heterogeneous sources rather than a homogeneous background. We believe that it is likely that background circulation and facilitated transport by plastics are both involved, indicating that pollutants in plastics are released to the local environment on remote and otherwise pristine coral ecosystems.

Safri Burhanuddin. Currently the Deputy Minister for Human Resources, Sciences and Technologies, and Maritime Culture, Coordinating Ministry for Maritime Affairs and Resources, Republic of Indonesia (since May 2015), Deputy Minister Safri Burhanuddin has a doctorate and other degrees in marine geology and marine geophysics and lectures at Hasanuddin University, Makassar, Indonesia.



Marine plastic debris management in Indonesia. Burhanuddin S. (*Tuesday 11 July, Plenary Presentation*) Marine plastic debris is a key environmental issue at global and national levels and has become a major threat to marine and coastal biodiversity. It is a threat to health of both ocean and human populations. As Indonesia has the second longest coastal line in the world, it is perceived to be one of the most probable to leak a large quantity of plastic debris into the ocean. Therefore, Indonesia has conducted a joint survey with the World Bank and the Kingdom of Denmark in 15 cities across the country to assess the problem. In conjunction with the US, research was done on plastics consumed by fish of two coastal cities, one in Indonesia and one

in the US. The findings demonstrated that there are real problems caused by plastic waste in our waters. Also affecting some islands, two-third of plastic bottles come from places as far as South Asia. Indonesia has developed a National Plan of Action (NPOA) for Combating Marine Plastic Debris, with five main pillars: i) Promoting behavioural change; ii) Reducing land-based leakage; iii) Reducing sea-based leakage; iv) Reducing plastic production and use; v) Enhancing funding mechanisms, policy reform and law enforcement. Furthermore, the government regulates the action plan at the subnational, national, international and regional levels, as well as through R&D community. The reduction of inland plastic waste reaching the ocean should be within reach by implementing strategic programs such as strengthening human resources and infrastructure management, plus promoting paradigm change within the society to respect the coastal areas through education curriculum and campaigns, as well as through reuse of plastic debris as asphalt mix. By adopting 5 main pillars and applying 5 strategic programs, we are hopeful that reducing marine plastic debris by 70% in Indonesia by 2025 is achievable. The presentation provides an overview of the NPOA, and also reports progress on several programs available to inform sound stakeholders for advice, in addition to strategic partners, in support for sustainable marine livelihoods through better-managed plastic waste.

Nikki (Nicoline) Chapman works for Sea Quests as the Projects Coordinator. She has coordinated the Ocean Stewards programme for 3 years and is passionate about the marine environment, conservation, education and capacity building. She is also a crew member on board the conservation research vessel *Angra Pequena* and has participated annually in the data collection research cruises as part of the ACEP offshore research projects, which gather vital information to assist in conservation planning and MPA expansion.



Building scientific knowledge and capacity through partnerships: the ocean stewards initiative. Chapman N, Livingstone T, Harris J, Gerrard M. (Monday 10 July, Parallel Session 1) South Africa is facing increasing pressure on its marine and coastal ecosystems as the country drives a process to unlock the economic potential of the ocean through development. It is vital that this development is carried out sustainably and with biodiversity targets in mind as this significant environment plays a critical role in the country's ecological health through the provision of essential ecosystem services. Skilled and confident individuals are crucial in decision making positions - in industry, government and conservation. The ability to meet the challenges facing the ocean and provide practical solutions is being compromised by insufficient human capacity within marine science and conservation management sectors. These shortfalls are linked to slow transformation and a lack of career-guidance. Furthermore, owing to the lack of affordable ship-based platforms, most students who do complete marine science degrees have no, or limited, ocean fieldwork experience. The Ocean Stewards Programme is a partnership between Wildlands and two African Coelacanth Ecosystem Programme (ACEP) east coast projects. It aims to address these challenges by providing catalytic marine science, management and industry exposure to a new generation of emerging Ocean Stewards. The two ACEP projects focus on gathering biodiversity data to support conservation planning and marine protected area expansion decisions on the east coast of South Africa. Central to the Ocean Stewards' experience is the opportunity for marine science students to participate in offshore research cruises, working alongside field scientists where they are exposed to different sampling techniques and equipment. This work has also provided important baselines for future monitoring of trends and impacts. Through this process, the Ocean Stewards are merged into the sector, being exposed to numerous initiatives focusing on the marine sector as well as gaining an understanding of the commercial needs linking to our oceans.

Takunda Chitaka is a PhD candidate in the Department of Chemical Engineering at the University of Cape Town. She holds a BSc in Chemical Engineering from UCT and a MPhil specialising in Sustainable Mineral Resource Development from UCT. Takunda is interested in sustainable development challenges in developing countries, with previous research experience in minerals beneficiation, multi-criteria decision making, life cycle assessment and sustainability performance assessment. Her current research is focused on the integration of plastic leakage into product life cycle management.



Estimating plastic leakage into the environment: the South African case. Chitaka T, Rodseth C, von Blottnitz H. (Monday 10 July, Parallel Session 1) The accumulation of plastic waste in

the natural environment has been an environmental concern for many decades, but a new global agenda is now taking shape to address the alarming growth in plastics in the oceans. Numerous studies have been conducted into the prevalence of plastic waste in the environment, typically reporting abundance and composition. However, there are limited quantitative estimates on the rate of plastic leakage into the environment, particularly in developing countries, which are often characterised by poor solid waste management practices. The South African national statistics quantifying plastic waste flows are limited to reporting formal disposal methods, namely landfilling and recycling, which do not account for leakage into the environment. One global study has estimated that up to 56% of plastic waste generated in South Africa is 'mismanaged' with the potential to leak into the environment and accumulate in natural systems. We dispute this figure based on the nature of the underpinning assumptions used and the misinterpretation of data sources. Of note is the exclusion of the informal sector which often plays a vital role in waste diversion in developing countries, accounting for at least 68% of plastic waste recovered for recycling in South Africa. Upon correction of significant errors in the waste generation and waste collection rates, the estimate of the proportion of mismanaged plastic in South Africa is halved. This revised estimate still indicates the need for improved waste management approaches. However, it provides little guidance for product stewards to focus product re-design efforts that have been identified as a key part of the new global plastics agenda. A realistic understanding of plastic leakage rates for different plastic applications could potentially help industries to reduce plastics accumulation in the environment by targeting frequently leaked plastic items for re-design.

Steve Cohen is an environmental and social justice advocate and the founder of the Durban partnership against plastic pollution. He is currently a non-executive Director at Durban Green Corridors and the AIDS Foundation of South Africa and runs his own consulting practice, SDC. He is a certified management accountant (ACMA) with a Masters degree in Environment and Development. He has 16 years' experience in project management, results-based planning, public sector budget support and development finance and has provided technical support to several national and provincial public health, conservation and social development programmes. Steve has extensive experience in implementing assignments for national government departments and international development partners



Innovation and urgency – the cornerstones of a coastal city response to the plastic pollution crisis.
Cohen S. (Tuesday 11 July, Parallel Session 1) eThekweni Municipality, known as the City of Durban, is located on the east coast of South Africa and is the country's third largest city with a population of over 3.5 million people. The city faces numerous challenges including high unemployment, public apathy and ignorance to environmental threats, and under-serviced townships and informal settlements. Growing volumes of post-consumer plastic and other packaging are polluting the city's open spaces, waterways and littoral zone, and entering its marine environment. This paper presents a review of the main social, economic and structural drivers of plastic and packaging pollution in the city and outlines the current multi-stakeholder response to the pollution problem. It presents evidence that demonstrates that the "business as usual" approach to plastic and packaging pollution in the city has a low probability of reducing the resulting negative environmental and socio-economic impacts. It argues that the response requires urgency that is underpinned by the acceleration of high impact interventions and the encouragement of innovation to deal with systems failure. It presents an alternative management paradigm and plan of action for plastic pollution to achieve desirable outcomes for the city and the international community. These actions include, inter alia: 1. Developing a suite of measurable goals at the city level for the reduction of plastic pollution, with a clear pathway to impact (aligned with the SDGs) and secure commitment to these goals. 2. Establishing innovative financing mechanisms to fund the action plan, including co-investment from relevant government departments, social impact bonds and funds generated from extended producer responsibility mechanisms. 3. Pilot and roll out community level pollution prevention and control solutions using innovation in community mobilisation, waste management and recycling systems. 4. Design and implement novel methods to incentivise consumers and retailers to reduce, reuse, recycle and re-engineer harmful plastic packaging products.

Matthew William Coote. Currently an MSc Candidate, supervised by Mr GK Moodley and Dr Deborah Robertson-Andersson, is working through UKZN, under



funding from the NRF. This research is a continuation of previous work from his Honours research project which focused on microplastic consumption and retention in filter-feeding fish (mullet). The results of this work indicated that microplastics are retained within the gut of mullet for significantly longer periods than natural food items, and that particle size and structure significantly affect these retention times. Current work aims to determine if any microplastic particles are assimilated on a histological level after ingestion, and what role the structure and size of the microplastics play.

Microplastics make fish anally retentive. Coote MW. (*Monday 10 July, Parallel Session 2*). Microplastic particles comprise a large component of marine plastic pollution and are highly prone to ingestion by marine organisms due to their small size and their presence in both pelagic and benthic environments. Ingested microplastics may affect an organism's physical processes such as digestion, assimilation and gut evacuation. There is currently very little research focusing on the gut retention time and fate of microplastics in filter-feeding fish, once ingested. Observational studies of fish in natural systems are unable to accurately correlate the extent of microplastic consumption with physiological effects, due to high natural variability. These eco-physiological effects are better examined in aquacultural systems. This study investigates whether microplastic particles are assimilated on a cellular level within the gastrointestinal tract of mullet (*M. cephalus* L.). Links are investigated between the likelihood of assimilation of certain microplastics in relation to their bio-availability and retention time. Mullet collected from Durban Bay were maintained on a one month depuration diet, after which gut retention experiments were conducted using various microplastics. Fish were then isolated and force-fed diets containing known amounts of various UV fluorescent microplastics every 48 h for 14 days. The fish were dissected and histological samples taken from the gastrointestinal tract. After chemical digestion of the tissue, light microscopy with UV light was used to determine whether microplastics were assimilated on a cellular or histological level in the gastrointestinal tract. Preliminary gut evacuation rate experiments with mullet indicated significantly increased retention times of 39.6 ± 5.8 h and 23.8 ± 10.4 h for microbeads (5 mm) and microfibrils (1 mm) respectively, compared to a natural gut retention time of 13.3 ± 1.6 h. Given that microplastics may serve as vectors of contaminants to marine biota, the increased retention times here observed may play an important role in increasing pollutant levels in fish.

Wesley Dalton has a BSc Marine Biology Degree from the University of KwaZulu-Natal (Westville Campus). Currently a full-time student doing a BSc (Hons) Marine Biology at the University of KwaZulu-Natal (Westville Campus), he is passionate about the ocean. His main interest is fish; however, his honours' thesis is on a species of caridean shrimp. He was selected as part of the 2016 Ocean Steward Initiative and has been invited back for 2017.



The uptake of microplastics via ingestion, in the caridean shrimp *Palaemon peringueyi* (Stebbing, 1915). Dalton W, Robertson-Andersson D, Moodley G.

(*Poster presentation*) Plastic pollution is a conservation issue that has received global attention for a number of years. More recently, the focus has shifted towards microplastic pollutants (< 5 mm). This study utilises microplastic fibres, the most commonly found microplastic pollutant in KZN estuaries. A common scavenger in KZN waters, the glass shrimp (*Palaemon peringueyi* (Stebbing, 1915)) may be exposed to microfibrils. *Palaemon peringueyi* serves as a prey item for several species; therefore, if the shrimp are taking up microfibrils it is possible that bioaccumulation of fibre-associated pollutants may occur. Little research has been conducted on decapod microplastic ingestion. It has been documented that shrimp can be sustained on artificially produced food; this experiment utilised a flake food readily taken up by *P. peringueyi*. Routes of microfibre ingestion were investigated. To eliminate confounding factors, the microfibrils were produced manually and validation experiments were performed. A 48-hour depuration experiment was conducted to determine if the species could survive without food after gut evacuation. Following the depuration, the percentage of feed ingested versus feed wasted was calculated. Different microfibre concentrations were examined to ascertain which best maintained the stability of the flake. Microfibrils were suspended in the water column to eliminate filtration as a form of uptake. The final experiment examined presence or absence of microfibrils in the gut and gut retention of fibres. The uptake of fibres by these shrimp is concerning as they can be used as live feed in aquaculture, which is for human consumption.

Sylvia Earle. National Geographic Society Explorer-in-Residence, former chief scientist at NOAA and Mission Blue founder and president, Dr. Sylvia Earle is an oceanographer, explorer, author, and lecturer. She has been called a "Living Legend" by the Library of Congress, and first "Hero for the Planet" by Time magazine. Showered with 28 honorary degrees expressing universal appreciation of her inspirational life, she has authored more than 190 scientific, technical, and popular publications; lectured in more than 80 countries; led more than a hundred expeditions and logged more than 7000 hours underwater; appeared in hundreds of radio and television productions and is the recipient of more than a hundred national and international honours.



The economic and environmental impacts of marine pollution: solutions and opportunities. Earle S. (Monday 10 July, Keynote Presentation) As a child when I first fell in love with the oceans and their amazingly diverse creatures, there was a perception that these massive water bodies were so big that they had a limitless capacity to absorb all that humans could put into them. Equally, the oceans appeared then to have an infinite capacity to provide sea life for human consumption. It seemed not to matter what we put in and what we took out, the oceans would cope! Now we learn from the Ellen MacArthur Foundation that if trends continue unchecked, we face the prospect of a greater mass of plastic in the oceans than fish in a few decades. The oceans are becoming acidic, warmer and increasingly plagued by permanent dead zones and toxic buildup, all of which affect marine life and humans. In my lifetime, I have seen once bountiful fish and other life disappear or decline to the verge of extinction. The amount of waste that enters and accumulates in the oceans every day is staggering; its impacts on all forms of marine life, on the health of ecosystems and humans who depend upon the sea is of growing concern. The role of Africa in turning the tide on plastic and other solid waste is pivotal as the problems of Africa are of global concern: what leaks from the African shores into the coastal waters is carried by ocean currents all around the world. The African Marine Waste Network provides opportunities few other continents have, the opportunity to promote change on a large scale. Every individual can make a positive change, but when you work collectively you can change Africa and hence the world. The Network provides the launching pad. The Network is already bringing the best in Africa and elsewhere in the world together to share ideas and find solutions, set new goals, develop innovative economic enterprises and build hope.

Kingsley Ebomah has an MSc degree in Microbiology. He works as a tutor while presently doing a PhD. His research work covers surface water, an aspect of Environmental Microbiology, and he has acquired skills in microbiological techniques such as membrane filtration, DNA extraction and PCR.



Prevalence and antibiotic susceptibility profiles of *Escherichia coli* strains recovered from the Nahoon Beach and its canal in the Eastern Cape, South Africa. Ebomah K. (Poster Presentation) The prevalence of pathogenic microorganisms as well as the proliferation of antimicrobial resistance is enormously significant to public health, but the magnitude of the impact of aquatic environments concerning the advent and propagation of resistance genes remains vague. *Escherichia coli* are widespread and encompass a variety of strains ranging from non-pathogenic strains to highly pathogenic ones. This study reports on the incidence and antibiotic susceptibility profiles of *Escherichia coli* strains recovered from the Nahoon beach and its canal waters in South Africa. A total of 73 out of 107 (68.2%) PCR-confirmed *E. coli* isolates were affirmative for at least one virulence factor; these included enteropathogenic *E. coli* 11 (10.3%), enteroinvasive *E. coli* 14 (13.1%) and neonatal meningitis *E. coli* 48 (44.9%). Interestingly, uropathogenic and enteroaggregative *E. coli* were not identified. The phenotypic antibiogram profiles of the confirmed isolates revealed that all 73 (100%) were resistant to ampicillin, whereas 67 (91.8%) of the pathotypes were resistant to amikacin, gentamicin and ceftazidime. About 61 (83.6%) and 51 (69.9%) of the isolates were resistant to tetracycline and ciprofloxacin as well as trimethoprim respectively. About 21.9% (16) of the isolates demonstrated multiple antibiotic resistances with 100% exhibiting resistance to eight antibiotics. In conclusion, the Nahoon beach and the canal waters are reservoirs of potentially virulent and antibiotic resistant *E. coli* strains and thus constitute a public health risk.

Neville Emslie has a PhD in Chemistry, specifically synthetic organic chemistry. He is Chief Scientist for Clariter, a company converting waste plastic to chemicals.



Conversion of waste plastic into chemicals. Emslie N. (*Wednesday 12 July, Parallel Session 2*) Apart from the challenge to reduce the future amount of plastic/polymer waste we are generating each day, another challenge is how we can constructively reduce the amount of plastic waste already polluting our land masses and oceans. Recycling of the huge waste collection is probably the only option we have. There are already many examples of recycling initiatives, including the conversion of waste plastic to fuel and the manufacture of plastic furniture. Clariter S.A. is a clean-tech company with an innovative technological solution to the world's waste plastic problem. Using a unique patented process, Clariter converts waste polyolefins (polyethylene and polypropylene account for almost 50 % of plastic waste) into high grade solvents, oils and waxes. Apart from the products derived from this process, opportunity exists to create much-needed jobs in South Africa, from the collection and sorting of the waste plastic to the use of these chemicals to grow the South African chemical industry. This conversion process can also be applied to marine polymer waste. Clariter is currently constructing an Industrial Scale Plant in the East London IDZ.

Ilana Engelbrecht is currently a MSc student in Zoology at the Nelson Mandela University studying the Cape gannet, although BSc Hons degree was obtained at the North-West University, specializing in microplastics and the African penguin. Two words to describe herself: passionate and motivated.



Identification of microplastics in the guano of the African penguin using FT-IR imaging. Engelbrecht I, Bouwman H. (*Poster Presentation*) Marine plastic pollution is considered as an increasing risk to marine wildlife, possibly posing a threat to endangered species. The marine environment can be subjected to microplastics either by direct introduction from runoff or by plastic degradation. Plastic debris may directly impair species that ingest them or get entangled in it, often leading to death or serious health consequences. The greatest concern of microplastics in the marine environment is their ability to pick up Persistent Organic Pollutants (POPs) via partitioning, ultimately entering the food web. The fate of these contaminated particles is, however, still poorly understood and should thus be monitored to prevent irreversible impacts on marine biota. Our research was conducted on the African penguin situated in the marine section of Addo Elephant National Park on Bird Island near Port Elizabeth. We hypothesized that the African penguin may confuse small fragments of plastic debris with prey, or indirectly ingest microplastics via their prey including small pelagic fish. The aim of the research, was (1) to determine if the African penguin may be subjected to marine plastic pollution by ingesting microplastics, (2) to generate a method to successfully extract microplastics from organic-rich guano samples, without influencing the structure of the fragments, and (3) to accurately identify plastic fragments using FT-IR (Fourier Transform Infrared) imaging. The initial results indicate that an alkaline hydrolysis method is successful for the identification and quantification of microplastics in guano samples, without affecting the structure or colour of the particles. By using this method in conjunction with FT-IR imaging we can thus determine which types of plastics are most commonly ingested by penguins. Despite the potential impacts of microplastics, actions to prevent the accumulation in the marine environment still lack precision, thus the root cause should be addressed through public awareness, recycling and frequent coastal clean-ups.

Karl-H Foerster. Currently the Executive Director of Plastics Europe, Karl has been working in the chemical and plastics industry, in more than 10 countries in Africa, Europe, Asia and North America, for more than 30 years.



Africa is a global priority for solutions to marine litter: no time to waste. Foerster K-H. (*Wednesday 12 July, Keynote Presentation*) Marine litter is human-created waste that has been intentionally or unintentionally discharged into the coastal or marine environment. Marine litter is not only unsightly – it can harm ocean ecosystems, wildlife, and humans. Its effects have prompted governments, private enterprises, environmental groups, and countless citizens to take action.

The plastics industry, not turning its back on its responsibilities, has not only taken action on regional / country level, but extended the effort to furthering its collaboration on global level. In March 2011, leaders from 47 plastics associations across the globe signed a declaration to combat the causes of marine litter. The Declaration of the Global Plastics Associations for Solutions on Marine Litter (Global Declaration) represented a public commitment by a global industry to tackle a global problem: plastic litter in the coastal or marine environment. Now with over 70 associations signing the declaration covering 35 countries, the declaration has been delivering project to cover 6 key areas and objectives. This presentation will shed light on where the industry stands towards providing solutions to the global scale and also highlight what is being done within the continent of Africa.

Julius Francis currently works for the Western Indian Ocean Marine Science Association (WIOMSA), which is dedicated to promoting the educational, scientific and technological development of all aspects of marine sciences particularly in the 10 countries of the region (Somalia, Kenya, Tanzania, Mozambique, South Africa, Comoros, Madagascar, Mauritius, Seychelles, and Reunion), and he has been involved in different aspects of conservation, research and management of coastal and marine environments in the western Indian Ocean (WIO) region for a number of years, working with many collaborators and partners including decision makers, local communities, managers, scientists and students. Involved in community based natural resources management, capacity building for MPA management and ICM, and planning and implementation of national and regional initiatives, he has also coordinated several regional training courses/programmes. His particular interest is in linking the knowledge that emerges from research to the management and governance issues that affect marine and coastal ecosystems in the region. Recently, he has been involved in setting up a regional platform for interactions between scientists and decision-makers under the auspices of the Nairobi Convention.



Managing marine waste in western Indian Ocean. Francis J, Waruinge D. (Tuesday 11 July, Plenary Presentation) Marine litter is today recognized as a global challenge. This problem is affecting not only countries with inadequate waste management systems but, due to ocean currents, even those with good waste management systems. According to the Transboundary Diagnostic Analysis (TDA) prepared under the project "Addressing Land-based Activities in the Western Indian Ocean (WIO-LaB)", five priority pollution categories in the Western Indian Ocean (WIO) region were identified, namely: microbial contamination; suspended solids; chemical pollution; marine litter (including debris); and eutrophication (harmful/nuisance algal blooms). Marine litter is a common feature along the coasts of the WIO region, especially of Comoros, Mozambique, Kenya and Tanzania. The main reason for the littering is that none of these countries has an adequate solid waste management system. In recent years, different initiatives, based on awareness, research and policy, aiming at addressing the issue have been undertaken at regional and national levels, with different results. This presentation will discuss these initiatives and new ones, particularly those aiming at building knowledge on marine debris and microplastics at sea

Mark Gerrard. Having majored in Wildlife Science and Agricultural Economics during his BSc Agric Degree from the then University of Natal Pietermaritzburg, Mark developed an interest in land tenure, the economics of community conservation and business development around conservation principles. He believes that we need to identify new and exciting ways to grow economic opportunities in rural communities using conservation as the economic driver. Currently, he is a Strategic Manager for Wildlands Conservation Trust, where he manages coastal and marine conservation initiatives, as well as those focused on community conservation.



The Blue Crew – generating livelihood support through a cleaner marine environment. Gerrard M. (Wednesday 12 July, Parallel Session 3) KwaZulu-Natal has one of the most beautiful coastlines in South Africa. The ecosystems along this coastline, including beaches, mangroves and estuaries, are often littered with plastic waste washed down from our rivers and up from our oceans. This reduces the ability of the ecosystems to function effectively as well as creating an unsafe environment for both people and nature. There are also many impoverished communities living along this coastline, adjacent to these beaches and mangroves. Many have little opportunity to support themselves through

employment. Our ability to recycle plastic brings with it the opportunity to generate revenue from this waste. By taking this into account, Wildlands is looking to address both the environmental and social challenges experienced through a new programme called the Blue Crew. The Blue Crew is a group of female entrepreneurs, based in local communities adjacent to coastal environments. Through the collection of recyclable material washed up on our beaches, mangroves and estuaries, these teams generate revenue for themselves and their teams of assistants through the cleaning of these critical ecosystems. The recyclable material is traded through Wildlands' Recycling for Life programme. Awareness of waste in our environments is built into the programme to ensure that an understanding of these ecosystems and their associated benefits is developed. This is combined with basic business training to ensure a strong understanding of the model, leading to improved sustainability of the teams.

David Glassom is a PhD candidate from the University of KwaZulu-Natal. His research revolves around the effects of microplastic ingestion on juvenile fish.



The effects of microplastic ingestion on the growth and survival of juvenile glassfish, *Ambassis dussumieri* (Cuvier, 1828). Glassom D. (Monday 10 July, Parallel Session 2) Juvenile glassfish, *Ambassis dussumieri* (Cuvier, 1828), was used as a sentinel species to investigate the effects of microplastic ingestion on fish growth and survival. Virgin and polluted plastics were fed to fish daily for three months and observed effects were compared to a control group. Fish length, width and mass were recorded at time intervals that were around 20 days apart. A pilot experiment confirmed that these fish had a gut retention time of plastics that was < 24 hours. Overall, the survival probability of the fish was reduced in the microplastics treatments compared to the control, which became pronounced toward the latter part of the experiment. Fish growth calculations are still being processed.

Linda Godfrey. Prof Godfrey is a Principal Scientist and Associate Professor at the Council for Scientific and Industrial Research in South Africa. She holds a PhD in Engineering from the University of KwaZulu-Natal and heads up the Waste Research Development and Innovation (RDI) Roadmap Implementation Unit on behalf of the Department of Science and Technology.



Waste management in Africa and the growing case for marine litter. Godfrey L. (Monday 10 July, Plenary Presentation). Marine waste is an issue of global concern, considered to be in the league of global environmental challenges such as climate change, ocean acidification and loss of biodiversity. The world's oceans are estimated to already contain 150 million tonnes of plastic and, without intervention, this figure is expected to increase to 850–950 million tonnes by 2050. The biggest contribution to marine waste comes from land-based sources. This is the direct result of poor waste collection and disposal practices. It is estimated that over 80% of ocean plastic originates on land, entering the oceans via rivers, storm-water runoff, or directly discharged into coastal waters. Of that, 75% comes from uncollected waste (poor city cleansing) and 25% from collected waste, where the waste re-enters the environment from poorly operated formal or informal dumpsites. African countries, like most developing economies, face the challenge of increasing waste generation, changing waste composition, poor waste collection, and disposal to uncontrolled dumpsites. All of these place additional pressures on already strained municipal services. According to ISWA, 19 of the world's 50 biggest dumpsites are located on the African continent. "Africa may become the dominant region in terms of total waste generation", particularly sub-Saharan Africa, where lower income cities are expected to double their municipal solid waste generation in the next 15–20 years. The state of waste management across Africa, means that unless measures are put in place to properly manage waste now, the continent is likely to become a significant contributor to local, regional and global marine litter.

Keshia Govender. With a Bachelor of Technology degree in biotechnology, Keshia is currently employed at SAAMBR Ushaka Seaworld as a water quality lab technician/monitor where she undertakes chemical and microbiological testing of seawater and fresh water. She has seven and half years' experience in the industry thus



far, having done her in-service training at eThekweni municipality food safety laboratory, where she did microbiological testing of food, milk and water.

The efficacy of various filter media in removing copper from treated seawater. Govender K, Lampen F. (*Poster Presentation*) Copper medication is used during Quarantine for those animals that are caught before being introduced to the colony. What is found is that, although copper medication is stopped, the copper remains in the system due to the copper having been absorbed by the rock work and the gravel on exhibits. This becomes a huge problem as copper sensitive animals cannot be introduced into the exhibit until the copper is removed. This is, however, a long process as copper leaches and absorbs for months on. My project involved removing the copper by adding filter media into canisters. I used four different media which were zeolite, activated carbon, polyfilter and powdered banana peels. It was noticed that the various filters had different absorption rates of the copper. Using banana was quite interesting because a lot of the copper was absorbed out of the system; however, the pH levels would drop. This project was done to ensure that copper can be removed from exhibits much faster and more cost effectively without affecting animal health, but instead helping SAAMBR to ensure that copper sensitive animals can be placed onto exhibits sooner, without losing precious marine life. This idea can be used in waste water treatment to remove heavy metals as these media can remove other metals besides copper, for example, lead.

Marietta Hopley is a respected entrepreneur and conservationist at heart, steering a number of successful portfolios. She is a Public Relations, International Politics & Business Administration Graduate. Her current involvements entail a wide spectrum portfolio as the co-owner of three South African based businesses, operating on both a national and international level. As a board director of one of the largest and most successful Switzerland based investment finance groups, it is evident of her other companies being successful and excelling among the South African and international audience. Marietta has received numerous awards in Environmental Entrepreneurism and acts as a Senior Consultant to all spheres of Government in Policy and Global Logistics. She currently serves as director and member on the board of four different world-renowned non-profit organisations – all relating to the environment and species welfare.



Let's Do It! World (LDIW) Cleanup Day 2018 & Strategy for Africa. Hopley M. (*Tuesday 11 July, Plenary Presentation*) Let's Do It! is a civic-led mass movement with a mission to connect and empower individuals and organizations around the world to stand up against the global trash problem; organising for this a World Cleanup Day. On September 15, 2018, World Cleanup Day, people in 150 countries will clean up waste, making it the biggest positive civic action the world has seen - with hundreds of millions of people taking positive action together on the very same day - engaging 5% of the world's population. This number represents the estimated amount of people necessary to create lasting change and go beyond just one day of incredible activism. Following this model, Let's Do It! Africa is not only about cleaning up waste. As an African civil society campaign, we're taking stewardship of this beautiful continent we call home. We also aim to unite African communities, record illegal waste occurrences, raise awareness and implement true change to achieve this global goal. Since its introduction to Africa, under the headship of the Campaign Ambassador, 11 national leaders of African nations were appointed to steer the campaign in their respective corners of Africa. The exciting challenge is to localise the campaign and make it authentic for the uniquely diverse African culture. Communicating with numerous communities that do not feel a strong personal connection with global issues such as waste, an unhealthy environment and unsustainable livelihoods – for several reasons - it is thus key to ensure a tailor-made approach that is locally important and attractive. The Let's Do It Foundation along with Dr Jenna Jambeck (Associate Professor, College of Engineering at the University of Georgia) will be leading a Waste Mapping Workshop on *Wednesday 12 July, Parallel Session 4*. The workshop will lay the foundation for coordinated activities and joint data analysis - which is key to understanding the global waste problem.

Pippa Howard has degrees in Marine Biology, Terrestrial Ecology, Environmental Sciences and International Development. Pippa directs Fauna & Flora International's (FFI's) engagement with the corporate sector and brokers collaboration and cooperation between business, government and civil society to address both practical



and policy challenges to biodiversity conservation. Pippa spent 12 years as an ESIA practitioner, consulting across industrial, urban, mining and oil & gas projects and continues to advise companies, governments and lender banks on environmental and social impact assessment and management planning. She spent a further 6 years working in sustainable development leadership at Cambridge University and has spent the past 10 years with FFI. She is a member of the International Association for Impact Assessment and a core member of the Biodiversity Working Group of the IAIA. Pippa has an in-depth understanding of the extractive sector, waste management and the business of biodiversity.

Co-presenter **Jonathan Knox** is a Technical Specialist at Fauna & Flora International (FFI). With over seven years' experience in geospatial modelling, experimental design and invasive marine biology, Jonathan provides technical input into a variety of topics across the organization including waste management, REDD+ carbon initiatives, hydrological and vegetation stress modelling and the impacts of infrastructure corridor development on forested landscapes. With degrees in Geo-Information Science, Remote Sensing, International Development and Environment, Jonathan is currently embedded within FFI's Business & Biodiversity Team working at the nexus of business, government and civil society. Prior to his time at FFI Jonathan was based in Canada attempting to stem the spread of marine invasive species with the Department of Fisheries and Oceans. He was also heavily involved in the restoration of mines and understanding agricultural nutrient flows. Since returning to the UK he has worked with the UK Environment Agency and as a Global Research Manager for a Climate Change publication.



Data and Research – A case study from Mozambique. Howard P, Knox J. (*Tuesday 11 July, Joint Plenary Presentation*) Population influx into remote regions under development by extractive and infrastructure companies (among others) leads to new and added conservation-related burdens upon the landscape. Lack of municipal infrastructure results in ingress and dispersal of plastic waste in the terrestrial and marine environment with consequent impacts to biodiversity through ingestion, contamination, physical harm and related increased mortality or physiological morbidity. Through the development of a proto-toolkit for waste prediction, monitoring and management, key waste hotspots/sinks were located in biologically sensitive areas in Palma district, Mozambique. In addition, potential locations were identified through trade and agricultural density indices, showing the most advantageous localities to establish waste enterprises and subsequently institute sustainable livelihoods with which to manage the waste. This presentation will look at the methods and pitfalls of such an approach and the future direction this research could take us in.

Workshop: FFI will also lead a workshop on how to conduct a critical habitat assessment (using freely available data) and integrate the results in the context of mitigating the impact of waste on biodiversity.

Samantha Infante. I am a BSc. Marine Biology honours student at the university of KwaZulu-Natal. I completed my BSc Marine biology undergraduate degree in 2016. I am also a member of MACE lab and the university and I aim to promote conservation and sustainability of our oceans.

A biodiversity assessment of Chaka's rock and surrounds: a region worthy of special management? Infante S, Moodley G, Olbers J, Robertson-Andersson D. (*Poster Presentation*) Chaka's rock is located on the KwaZulu-Natal coastline, situated on the sub-tropical east coast of South Africa and is known for its high biodiversity; however, conservation efforts in the urban regions are minimal. Thus far, only a species list has been generated for the region but a complete biodiversity assessment is needed. This paper aims to determine whether Chaka's rock has biodiversity significantly high enough to be declared a 'special management area' under the National Environmental Management Act: Integrated Coastal Management Bill, 2006. According to this, a region may only be declared under special management if environmental, socio-economic or cultural conditions require introduction of measures to conserve biodiversity, promote sustainability or enhance coastal ecosystems. A biodiversity survey, using transects, Baited Remote Underwater Video (BRUVS) and observations, of three sub-regions in Chaka's rock, were completed. Chaka's rock was sub-divided into a southern, northern and a tide pool site. Within the northern and southern sites, five permanent transects spanning across 20 m intervals, were laid and quadrats were laid down perpendicular to the



shore at two meter intervals. Data from the transects were preserved using image capturing. In the tide pool, four transects were laid and underwater photo-quadrats captured the data. The images were then analysed using Coral Point Count with Excel extension (CPCe) to determine the diversity indices. The relative abundance of fish in the tidal pool was determined using BRUVS. Manual recordings of mobile species were taken using observational studies for each transect at each site. In addition, usage of the sites was monitored for 8–12 hour periods via video analysis over three days. The data was compared to comparison sites south of the Chaka's Rock, in summer and winter. A biodiversity assessment and species inventory will provide information for conservation, management options and long-term sustainable use of Chaka's rock.

Oladimeji Iwalaye. I have a BSc. in Zoology and MSc. in Zoology (Animal physiology major). Presently, I am a PhD candidate in Marine Biology, Aquaculture, Conservation Education and Ecophysiology (MACE) Laboratory at University of KwaZulu-Natal. My research focused on the effect of microplastics on some selected marine invertebrates.



Microplastics in the oceans: the emerging threats. Iwalaye O, Moodley GK, Robertson-Andersson DD. (Poster Presentation) The mass production of plastics began over the last 70 years and has since steadily increased. The unlimited and indiscriminate use of plastics has resulted in them comprising 80% of marine debris. Plastic debris can be divided into macroplastics and microplastics; the former are well known as an international problem while the latter have received less attention. Many users consider plastic to be a biochemically inert material and are unaware that additives are added to the polymer during the manufacturing processes, to perform several functions such as: increasing the degradation time, decreasing flammability, increasing/decreasing rigidity etc. These additives can transfer from the polymer into the environment. In addition, polymers attract, adsorb, accumulate and transport a wide array of organic pollutants in the marine environment. A wide range of organisms such as plankton, benthic invertebrates, vertebrates and mammals accidentally or selectively ingest microplastics during normal feeding activities. On ingestion by organisms, the chemicals have the potential to be transferred from lower trophic levels to higher organisms. This study investigates the effects of varying size and concentration of microplastics on the ingestion, retention and evacuation rates in *Pyura stolonifera* H., *Dotilla fenestrata* L. and *Holothuria cinerascens* S. from Durban Bay, Republic of South Africa. In the laboratory, animals were exposed to fluorescent polyethylene beads of different sizes (125 µm to < 5 mm) in diameter and concentrations (50mg/l, 150mg/l and 250mg/l). Animals were dissected after 12 hours – 4 days of exposure and gut contents were viewed under epifluorescence microscope. Polyethylene found in the gut and faecal pellets was quantified and used to determine the ingestion, retention and evacuation rates. The results of this study will contribute not only to our understanding of ingestion and retention of microplastics in marine invertebrates but also to the susceptibility of these organisms to microplastic pollution.

Masa Iwata is project manager of the Greeneye Project, which focuses on research on coelacanth biology at Aquamarine Fukushima. We have conducted surveys in Indonesia and Tanzania since 2004. The project has succeeded in filming living coelacanths in their habitat.



The influence of ocean garbage on 'Old Four Legs', the coelacanth. Iwata M, Syhailatua A, Hukom DF, Makatipu PC, Peristiwady T, Masengi KW, Mandagi IF, Pangalila F, Abe Y. (Tuesday 11 July, Parallel Session 1) The Indonesian coelacanth, *Latimeria menadoensis*, was found off Manado in the north of Sulawesi Island of Indonesia in 1997. Since then, seven specimens have been recorded in bycatch. A specimen caught off the coast near Amurang Bay in 2010 was a male, TL: 112 cm, BW: 13.1 kg. In its stomach, a snack bag of 25 cm x 18.5 cm and remnants of plastic of 16 cm x 9 cm were found. This specimen was considered to be in poor health. It was thinner than another male specimen that was almost same size, or 110 cm / 20 kg. Aquamarine Fukushima has conducted field surveys in Indonesian and African waters since 2004. The coelacanths were observed in depths between 100 m and 300 m and have been filmed by ROV. Since the coelacanths live in a rocky habitat close to the shoreline, they are easily affected by human impacts on the environment. The coelacanths are one of the precious living fossils, with two species of coelacanths

still remaining, *L. chalumnae* off the east coast of Africa, and *L. menadoensis* off Indonesia. The incident of the specimen affected by plastic pollution was accidentally revealed to us because of bycatch; otherwise, it would have died on the bottom of the deep sea. We need to share this information with people in the coelacanth-inhabiting countries in Africa and Indonesia, and avoid plastic waste negatively affecting not only the coelacanth, but also any deep-sea creatures.

Jenna Jambeck is an Associate Professor in the College of Engineering at the University of Georgia (UGA). She has been conducting research on solid waste issues for 20 years with related projects on marine debris since 2001. She also specializes in global waste management issues and plastic contamination. Her work on plastic waste inputs into the ocean has been widely recognized by the global community and translated into policy discussions by the Global Ocean Commission, in testimony to U.S. Congress, G7, G20, and the United Nations Environment program. She has won awards for her teaching and research in the College of Engineering and the UGA Creative Research Medal, as well as a Public Service and Outreach Fellowship for 2016-2017. She is co-developer of the mobile app Marine Debris Tracker, a tool that continues to facilitate a growing global citizen science initiative. The app and citizen science program has documented the location of over one million litter and marine debris items throughout the world.



Plastic waste inputs from land into the ocean: we can come together to solve this global problem.

Jambeck J. (*Tuesday 11 July, Keynote Presentation*) Plastic debris and its impacts in the marine environment have been widely documented, but the quantity entering the ocean from land was previously unknown. By linking worldwide data on solid waste, population density, and economic status, we estimated the mass of land-based plastic waste entering the ocean. We calculate that 275 million metric tons (MT) of plastic waste were generated in 192 coastal countries in 2010, with 4.8 to 12.7 million MT entering the ocean. Population size and the quality of waste management systems largely determine which countries contribute the greatest mass of uncaptured waste available to become plastic marine debris. Without waste management infrastructure improvements and other changes, the quantity of plastic waste available to enter the ocean from land is predicted to double by 2025 for a cumulative input of up to 155 million metric tons. Dr. Jambeck will discuss the methods and results, as well as potential solutions to this problem while sharing stories of integrating technology and citizen science into solutions, and crossing the Atlantic Ocean on a sailboat with thirteen other women conducting research and promoting women in STEM and other underrepresented disciplines. Her discussion of solutions will include ideas for countries in Africa that might be included in the "Guide to Action for Africa" that will be produced from this conference.

Maya Jacob John is a principal researcher at the Polymers and Composites unit at the Council for Scientific and Industrial Research (CSIR) in Port Elizabeth. She holds positions as a research associate at Nelson Mandela Metropolitan University and senior research fellow at Wits. Dr John's current research focus is the development of materials from renewable and sustainable resources, and includes areas on natural-fibre-reinforced composites, bio-based materials and agro-waste beneficiation. She has published more than 61 peer-reviewed international journal articles and book chapters, holds a patent, has an h-index of 26 and a total of 4114 citations. Dr John has made more than 33 national and international conferences presentations including a plenary lecture. Dr John received a CSIR award for research excellence in the young researcher category and DST Young Woman Scientist first runner-up award in 2016.



Development of bio-based materials from agricultural waste residues. **John MJ, Mtibe A, Naidu D, Lefatle M.** (*Wednesday 12 July, Parallel Session 2*) The current problems of depleting petroleum reserves, global warming and environmental pollution have stimulated global efforts to find a bio-based feedstock (as a replacement for petroleum based reserves) from which bio-based chemicals and materials can be derived. Lignocellulosic biomass is composed of trees and agricultural waste residues (bagasse, corn stover, straws), which are valuable materials that can potentially be utilized as a raw material feedstock to produce high-value products. Currently agricultural waste residues are traditionally land-filled or burned resulting in air pollution and environmental hazards. Lignocellulosic biomass comprises cellulose, hemicellulose and lignin. Cellulose can be converted to cellulose nanomaterials (cellulose

whiskers and cellulose nanofibres) by the process of acid hydrolysis and dialysis. Cellulose nanomaterials have the potential to be used in fields ranging from material science to biomedical engineering due to their excellent mechanical properties, tailorable surface chemistry, biocompatibility and biodegradable nature. Hemicellulose composed of C5 and C6 sugars have xylan fractions, which possess good barrier properties and have applications in the packaging sector. Lignin is a by-product of lignocellulosic biomass utilization processes such as pulping and biomass refinery. It is a highly cross-linked aromatic polymer and possesses flame retardant and antioxidant properties. This study investigates the effective utilization of agricultural waste residues to produce novel bio-based products. The presentation will highlight the fractionation techniques employed and experiments relating to conversion of fractionated components to value-added bio-based products.

John Kieser has a BTech Degree in Conservation. Currently working with Plastics SA on Marine Debris, he is also a consultant on problem animal control in environmentally sensitive areas. John has more than 30 years' experience in conservation and in leading various projects regarding marine debris.

1. 20 years of citizen science. Looking at the international coastal cleanup as a platform for raising awareness. Kieser J. (Tuesday 11 July, Parallel Session 1) The International Coastal Cleanup is the largest cleanup of waterways and shorelines internationally. South Africa has been part of this project for the last 20 years with Ocean Conservancy and a myriad of other partners. 20 years have given us a treasure on marine debris data on the South African Coastline nationally. It has also been an incubator for projects and actions that addressed the issue of local pollution sources.



2. Projects responding to the issue of marine debris. Kieser J. (Wednesday 12 July, Parallel Session 3) The plastics industry is in some circles demonized as a non-caring industry when it comes to the issue of pollution. It seems to represent consumerism and non-caring, but in reality, the opposite can be seen. Obviously, as in all spheres of life, the industry is far from perfect but it is concerned about the issue of marine debris and its impacts internationally. Plastics SA has been boxing below its weight for years and this conference is a direct result of this work. This presentation looks at the various actions being done by the industry federation to address the issue of marine debris.

Jaka Kranjc. My passion is to collect and to share data, and I dream big. With my colleagues from Let's Do It Foundation and in cooperation with like-minded organisations, I am going to build the global garbage database to give relevant and up-to-date location-based information of recyclables. I am in product-owner role and I also coordinate internal resources, volunteers and third parties for the flawless execution of the mapping tool and world waste platform that supports World Cleanup Day 2018. Steps towards a zero-waste world and living life in harmony with nature is my goal, and to reach that I have been surrounded myself with like-minded people.

Marine debris/litter data workshop - focus on mobile app collected data and the world waste platform. Kranjc J. (Wednesday 12 July, Parallel Session 4, Mobile Apps Workshop) This workshop is for participants who have faced the problem that litter and waste pollution related data is scattered among many different databases and it requires time and effort to bring together in a meaningful way. As the conference brings together the best and the brightest in Africa and abroad, including researchers, practitioners, industry, media, and government, it would be a perfect place to build a network that could help facilitate and encourage data sharing and harmonization. During the workshop, Dr Jenna Jambeck, an Associate Professor in the College of Engineering at the University of Georgia, Marine Debris Tracker co-developer, Marietta Hopley, Let's Do It Ambassador African Continent and Jaka Kranjc from Let's Do It will discuss with participants how to obtain suitable terrestrial/marine litter data for joint analysis, and how to promote public interest and enthusiasm towards data collection and clean-up actions. Delegates will get a summary of the applications available to users. It will contain details about apps' design, functionality and data collected.



All participants can brainstorm in advance among their organizations:

- what kind of waste pollution data should be comparable?
- What data should be collected by citizens and how should it be collected?
- How to combine existing datasets, where, why, which?
- What will change in people's lives if they can be part of data gathering process?
- what approach could allow direct comparison and identification of waste problems across different geographical regions?
- Are applications the best way to collect data/generate public awareness/promote environmental education?

The aim is to start building a common ground for coordinated activities and joint data analysis.

Travis Kunnen MSc Marine Biology, PhD Candidate at UKZN. I work primarily on assessing heterotrophic bacterial numbers, biomass and productivity within aquatic ecosystems. I do this because bacteria are the baseline of many food webs and, without their recycling ability, through the microbial loop, reintroducing essential growth limiting nutrients, these essential nutrients would be lost, they would literally sink, into the bottom sediment. Not only do bacteria provide baseline data for food web analysis via carbon cycling, but by looking directly at their numbers, biomass, productivity and their interactions, you can estimate the general health of the system in question. High numbers, low biomass and low productivity means one thing, while low numbers, high biomass and high productivity means something else



Automated analysis of fluorescent microplastic fibres. Kunnen T, Gerber G, Coote M, Moodley G, Robertson-Andersson D. (Monday 10 July, Parallel Session 2) Marine plastic pollution consists of both macroplastic (> 5 mm) and microplastic (≤ 5 mm) particles, of which there are two main types: Primary microplastics are generally used for commercial and industrial abrasives, while secondary microplastics result from the disintegration of larger plastic particles. One of the largest sources of secondary microplastics is the shearing of plastic textile fibres from clothing in washing machines, and with the increase in domestic appliance reliance, plastic microfibre pollution is escalating. The need to accurately and reliably count and size microplastic fibres from environmental samples or laboratory experiments, is impeded by the slow process of sifting through sand, gut contents and filters, and the use of manual evaluation by microscopy. We present here the use of a macro-enabled counting and analysis program coded specifically for IPP (Image-Pro-Plus) for the automated analysis of fluorescent microplastic fibres. Manually collected data was compared to data from the automated counting feature to test the efficiency, accuracy and reproducibility of the macro. Accuracy of counts, size measurements and time taken for analysis, were compared. The macro showed no statistical differences between the numbers of fibres counted and size measurements (with the use of an algorithm). A significant difference for average time taken for analysis was found with manual taking longer than automated analysis (23.90 ± 6.86 vs 1.2 ± 0.77 mins respectively per filter (12 images)), resulting in a massive 2382 % decrease in time taken for analysis using the automated counting. The automated counting decreased user errors as well as saving time and effort thus endorsing its application for accurately counting and sizing microplastic fibres

Thabo Magomola is a member of the project team tasked with the establishment of the Waste Management Bureau, which is the DEA's implementation agency for strategic waste management programmes, such as Industry Waste Management Plans. Thabo's primary responsibility is the design, development and implementation of the Recycling Enterprise Support Programme (RESP). The RESP is an initiative that was spawned from a resolution taken by the Minister, Honourable Edna Molewa, and the MECs of all 9 Provinces. The aim and objectives of the RESP is to identify and deliver the necessary support mechanisms to emerging entrepreneurs in the waste economy, such that they are able to significantly contribute to the diversion of waste to landfill while creating jobs and economic prosperity.



Circular economy employment and SME development in southern Africa. Magomola T. (*Wednesday 12 July, Plenary Presentation*) It is my intention to deliver an oral presentation using slides that focuses on the opportunities in the coastal regions in Africa to create employment and various economic opportunities through the remediation of waste through circular economic activities. With the expected population increase by a little over 8 million by 2030, it can be expected that urgent action should be taken. For the next 20 years, South Africa will have over 14 million young people between the ages of 15 and 29. The number will peak in 2021, reaching 15.1 million. This presents a tremendous opportunity – but it also constitutes a serious risk, given that joblessness mirrors age and race fault lines. Unemployment rates are highest among the young in the group aged between 15 and 34 (36.1% in 2014). For black youth, the unemployment rate is 39.4%. If left unresolved, this trend poses the single greatest risk to social stability. Goal 8 of the Sustainable Development Goals (SDGs) seeks the creation of decent work and economic growth. The African Marine Waste Network in conjunction with Government and other role players can realise this objective through the adoption of relevant best practices which can in fact be found in Africa. The Waste Management Bureau, the implementing body of the Department of Environmental Affairs (DEA) has recently launched the Recycling Enterprise Support Programme (RESP), a Ministerial initiative intended to support the growth and upskilling of entrepreneurs in the waste sector. The facilitation of economic opportunities and job creation in the waste sector for the benefit of historically disadvantaged individuals therefore remains a crucial outcome of the implementation of the African Marine Waste Network initiative.

Hayley McLellan Environmental Campaigner at the Two Oceans Aquarium. Hayley began her career in 1989 training dolphins at Sea World, Durban. Ensuing years saw her dedicated to animal care, behaviour and presentations of many creatures. Her ever-evolving conservation awareness and experiences grew her passion for preservation of the environment. As Environmental Campaigner at the Two Oceans Aquarium, human behaviour is her newfound inspiration. She seeks a variety of audiences to share her campaigning enthusiasm with, trusting that humans essentially want to do right by the planet. The vision of a plastic shopping bag free South Africa is currently her life's work



Rethink the bag – for a plastic shopping bag free South Africa. McLellan H. (*Wednesday 12 July, Parallel Session 2*) Controversial or not, the plastic shopping bag has got to go. Repeating identical behaviour leads to identical results which, in the case of South African's using up to eight billion bags each year, has led to unmindful behaviour fashioning us into a "throw-away-society". Retailers negligently dole out this convenience every day and the result of this is simply more environmental pollution, much of which ends up in the ocean. This campaign seeks to enter into solutions-based dialogue with role-players to dramatically reduce plastic shopping bags in all retail spaces. The ultimate objective is that our government legislates a nationwide ban, whilst always taking the South African context into consideration in terms of the processes required. The growing evidence of multiple international plastic shopping bag bans heavily supports this cause's goal. Multi-layered consumer research is essential in understanding levels of education, and awareness of the detrimental effects of these bags on the environment. Part of this process will be to assess their willingness to adopt instant reusable behaviour for long-term reward, meaning a healthier more sustainable future. By tapping into consumer influence in this way we stand to potentially shift the currently acceptable norms of traditional waste disposal, for adopting a new behaviour often becomes about so much more. Seeking sustainable alternatives involves supporting existing plastic bag manufacturers to retain market share, continue growing healthy levels of employment and being a part of the solution for a cleaner South African environment.

Michael Melato. Born and raised in Africa, from Kgorsong (Borhville) in South Africa, Aupaki Michael Melato is a PhD candidate with ten years of experience in environmental affairs. He holds a Masters Degree in the field of ecotoxicology from the Cape Peninsula University of Technology and is currently employed as Environmental Specialist at Transnet National Ports Authority in Cape Town. Michael has served as a member of many environmental organizations across South Africa and abroad. He was the first African to serve in SETAC Europe, both in the Student Advisory Council and as a Chair for the Young Environmental Scientist Committee. A delegate in Abidjan Convention, where he decided to dedicate his studies for service on the African continent through a Ports environmental pollution perspective.



Environmental knowledge, attitudes and perceptions of Port of Cape Town users as they pertain to waste and pollution management. Melato AM, Uys C, Schutte D, Odendaal JP. (Wednesday 12 July, Parallel Session 1) According to the Environmental Management Department (EMD) of Transnet National Ports Authority (TNPA) there are numerous environmental challenges that ports are faced with in southern Africa. The Port of Cape Town is not excluded from those challenges. Due to various activities conducted within the port premises and in surrounding areas, waste generation and pollution are of the greatest challenges. Environmental pollution in the Port of Cape Town is an on-going problem that has serious implications for port operations, for the future of the port and the surrounding environment. Without understanding the port industrial user's knowledge, attitude and perception, it is likely that the current practice will continue, despite the laws, standards and legislation in place. In gaining an understanding of the sensitivity of human behaviour towards the environment, the research findings are anticipated to help develop a strategy that will address the current situation and assist in formulating the best environmental management practice in the Port of Cape Town. The objectives of the study were: To determine the knowledge, attitudes and perceptions of port users regarding waste and pollution management; To identify the potential barriers and opportunities for the port as they pertain to waste and pollution management; To assess and evaluate the roles of relevant governmental stakeholders other than port users in waste and pollution management in the port. The data of the study were collected in self-administered questionnaires, which were distributed to 165 managerial and 636 non-managerial employees of the TNPA, as well as purposively sampled tenants, contractors and waste licenced permit holders that are users of the Port of Cape Town. Interviews were also conducted to the relevant departments of government. For the purpose of this explorative descriptive study, the statistical analysis was done by using the SPSS statistical package. The study revealed only 36%–40% success of waste and pollution awareness and training collaboration programs between industries and the governmental departments. There is a need for continuous improvement between these stakeholders.

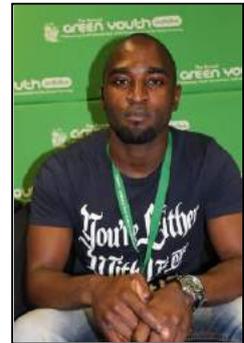
Karin Minnaar. I am a full-time PhD student at the North-West University, South Africa. I completed my Masters degree in a agricultural ecotoxicology field. From there I started working with marine debris on the Mascarene Islands, and now I focus on pollutants in water birds. I have taught animal behavioural sciences at the NWU. I am also a member of the Water Guardian Network, working closely with the Race for Water Odyssey to bring awareness of marine debris to the public.



Plastic debris along the shores of three remote islands in the western Indian Ocean. Minnaar K, Choong Kwet Yive R, Bouwman H. (Monday 10 July, Presentation Parallel Session 1) Plastic marine debris has been highlighted over the past decade as an increasing problem. Plastics may end up in the oceans in numerous ways, including improper waste management, deliberate or unintentional dumping, or through stormwater runoff. Plastic debris can be transported over long distances by ocean currents. This presents the potential of facilitating the long-range transport to and accumulation of persistent organic pollutants (POPs) in "pristine" environments. A previous study found concentrations of mercury, POPs, and other chemical pollutants associated with plastics, in remote oceanic locations. Plastic pollution is also associated with entanglement, suffocation, and ingestion of plastics by many marine species. This study aimed to determine the concentration of accumulated plastic debris beached on three remote Mascarene Islands in the Indian Ocean situated along major currents (Agalega, St Brandon's Rock, and Rodrigues). Transects were conducted along the up-current and down-current shores of each island. Final plastic counts were calculated per square-meter of

shoreline for each individual island. The up-current side of each island had significantly higher plastic debris per square-meter shoreline than the down-current. St Brandon's Rock had the highest concentration of plastics of all three islands, but it has the smallest number of residents. Thus, these results show high numbers of foreign plastic debris being trapped on these remote locations with possible detrimental effects to the coastal biota.

Zwelibanzi Mnguni is the Founder & CEO of Destination Green Recycling. Although he is an outstanding soccer player, Zwelibanzi is also passionate about, and is well qualified in, Civil and Environmental Engineering. He is driven and inspired to enhance the quality of life for humans and other living organisms. Destination Green Recycling has been blessed to have met many individuals and organisations in Industry who they have partnered with, and who continue to help them to grow and succeed. "We believe that we will excel in this endeavour because in addition to being passionate, driven and positively minded, we have obtained the necessary knowledge and skills set to make it a success. We are also open and keen to learn new skills which will help us to grow and become excellent."



Youth in Recycling – our recycling journey. Mnguni Z. (Wednesday 12 July, Plenary Presentation)

Destination Green Recycling is a youth-led and youth-focused recycling company that was initiated in October 2015 by two BSc Civil and Environmental Engineering Graduates from the University of the Witwatersrand, Johannesburg. The daily operations of Destination Green Recycling deal with separation-at-source-programmes. The main aim is to reduce the quantity of recyclables that end up at the landfill (waste diversion), through the collection, sorting and resale of the recyclables. Destination Green Recycling provides waste management, waste removal and event greening services in Tembisa (East of Johannesburg) and has also implemented a mobile buy-back service to support the waste-pickers and community. Destination Green Recycling was founded upon 3 core values: 1. Bridging the gap between collectors, local waste-pickers and recycling buy-back centres, therefore ensuring fair and accountable trade. 2. Educating and raising public awareness with regards to recycling and caring for the environment. 3. Creating jobs and employment opportunities in the townships, especially for the youth. Youth development and empowerment in recycling, the environmental sector and Green Economy cannot be over emphasised. Destination Green Recycling is currently one of the Youth Ambassadors of the National Recycling Forum (NRF).

Gan Moodley. Gan currently serves as an academic in the Marine Biology section of the School of Life Sciences at the Westville campus of UKZN, lecturing to both undergraduate and postgraduate students, supervising postgraduate student projects and undertaking research in the MACE lab. He has numerous years of teaching and research experience, has attended many local and international conferences and workshops, and has supervised many postgraduate students. His research interests lie mainly in the following fields: Marine biodiversity, Mariculture, Conservation Education, Marine Ecotoxicology and Ecophysiology, and Biological Education. The research undertaken may be both basic and applied, but there is a strong focus on ecologically- and commercially-applicable research.



The effect of near-future ocean warming and acidification on the ingestion rate of microplastic fibres in *Perna perna* (L.). Boodraj PD, Robertson-Andersson D, Moodley G. (Monday 10 July, Presentation Parallel Session 1) Literature on the combined effect of ocean warming and acidification on ingestion rate of microplastics in marine organisms is scarce. *Perna perna* is a socio-economically and ecologically important mussel on the KwaZulu-Natal coast. This study investigated: (1) the effect of near-future ocean warming and acidification on the ingestion rate of microplastic fibres in *P. perna*; (2) effect of starvation on the ingestion rate of microplastic fibres in *P. perna*; (3) lengths of microplastic fibres ingested by *P. perna*. Similar sized mussels were subjected to varying pH and temperature treatments while feeding them a known concentration of fluorescent microplastic fibres for 24 hours. Mussels were thereafter dissected and analysed using UV light microscopy, to determine the ingestion rate and size of ingested microplastic fibres. The average ingestion rate significantly increased with near-future ocean warming and acidification. Starvation of mussels prior to near-future ocean warming and acidification treatments caused a significant increase in the average ingestion rate of microplastic

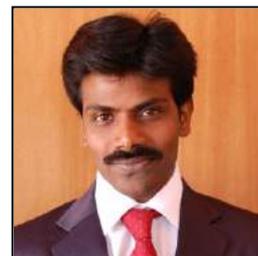
fibres. *Perna perna* ingested microplastic fibres within the range of 10–420 μm . Starved mussels ingested significantly more, larger fibres than the fed ones. Larger fibres have greater surface area to volume ratio enabling greater toxicant adsorption. These results imply that near-future ocean warming could lead to *P. perna* ingesting more and larger-sized microplastic fibres placing it at risk of taking up toxicants that can be bioaccumulated up the food web to humans. The result here obtained is currently being extended into work using mussels as bioindicators for microplastic pollution. In mitigation, a concerted effort by all is required to use alternative clean energy sources and to urgently implement the 3R strategy for plastics: Reduce, Reuse, Recycle! Public awareness should be created globally to educate people on the adverse effects of microplastics on marine environments and biota.

Charles Muller is a qualified financial accountant with an IMM diploma in marketing management. He spent 20 years in the polymer raw material industry working for the German chemical giant Hoechst AG where he was responsible for the sales & marketing activities of their locally produced polyolefins. Upon leaving Hoechst he established & ran a couple of small packaging distribution businesses until he was approached by Astrapak Limited, at the time South Africa's largest focused plastic packaging company, where he headed up their group marketing - this role involved, inter-alia, responsibility for the groups various sustainability initiatives. He left Astrapak early in 2013 to establish his own plastics & packaging consultancy business. He remains actively involved in the plastics, packaging and recycling space in SA & sits on a number of different industry executive committees & boards – he assumed the role of Executive Director of Packaging SA (previously PACSA) on 1 September 2013.



Plastics and packaging: is it all bad? Muller C. (Wednesday 12 July, Plenary Presentation) This presentation will provide a short overview of the South African paper and packaging sector and will highlight what the author perceives to be some of the more important consequences of banning either plastics or packaging or both. The presentation will also touch on some of the successes that have been achieved by the various voluntary Producer Responsibility Organizations (PRO's) and what further initiatives are still required to improve the management and handling of our paper and packaging waste in SA so that we continue to play our part in eradicating the unacceptable scourge of packaging and other debris in our marine environment

Sudhakar Muniyasamy PhD, is a Senior Researcher in the field of bioplastics and biodegradable polymers for packaging applications at the CSIR Material Science and Manufacturing Unit, Polymer and Composites Research group in Port Elizabeth, South Africa. He received his PhD degree in Chemical Science from University of Pisa, Italy (2007–2010). He had postdoc experiences from University of Guelph-Canada (2011–2013). He has published 18 peer-reviewed journal articles, contributed 5 book chapters and 1 book. He has attended and presented more than 50 research papers in various international conferences/meetings. He has been actively involved in scientific reviews of various international journals which relates to degradable and bio/environmental polymers. His R&D excellence has helped in developing various industrial bio-products and biomaterials manufacturing.



1. Environmental biodegradation of bio-based materials in biotic conditions. Muniyasamy S, Mtibe A, John MJ, Anandjiwala RD. (Wednesday 12 July, Presentation Parallel Session 2) The end-of-life management of post-consumer plastic materials plays an important role in the development of sustainable polymer products. In the last few years, re-engineered bioplastics and biocomposites materials are meeting increasing attention for short-term applications and for mitigating the environmental issues created by post-consumer plastic disposal practices. The present study involved the understanding of environmental impact of bio-based materials in various environments (marine water, soil and mature compost). The samples chosen included: Poly (lactic acid), Poly butylene succinate (PBS) and Poly (3-hydroxybutyrate-co-3-hydroxyvalerate (PHBV), and biopolymer blends, PLA/PHBV and PLA/PBS and biocomposites from sugarcane bagasse (SB) and biopolymers. In this study, the mineralization (ultimate biodegradation) of these biopolymers, biopolymer blends and biocomposites were assayed on the basis of amount of carbon mineralized in biotic environments

(aqueous, soil and compost) for a period of six months. During this environmental degradation conditions, hydrolysis and oxidation processes were monitored by the evaluation of the hydrolysis Index (OH_i) and carbonyl Index (CO_i) profile by FT-IR spectroscopy. All the test materials were subjected to degradation ensuring maximum extent of hydrolysis and oxidation processes. Changes in the thermal properties such as melting temperature (T_m) and degree of crystallinity were assessed by using differential scanning calorimetry (DSC). The decomposition temperature (T_{onset}) and weight loss, were determined by using thermogravimetric analysis (TGA). The ultimate biodegradation results showed that the composites containing sugarcane bagasse has applications in the packaging sector with the added advantage of enhanced biodegradability in natural environmental conditions (marine water, soil and compost). The present study constitutes a useful protocol to investigate the interactions between nature and degradation products of bioplastics and biocomposite materials in a dynamic system.

2. Triggered biodegradation of linear low density poly(ethylene) (LLDPE) films containing bio-based pro-oxidant/pro-degradant additives for ecological applications. Muniyasamy S. (Poster Presentation) The durable properties of plastics such as those based on polyolefins make them the ideal material for a large number of applications. Major mercantile segments including packaging & single use disposables accounts for more than 40% of the overall plastics consumption. However, the disposal of these plastic products poses a serious environmental problem and represents a relevant drawback due to their biodegradation resistance and accumulation in nature. In this regard, a great deal of research activity is now focused on the development of Environmental Degradable Polymers & Plastics (EDP) around the world. The present study deals with the preparation of biodegradable polyethylene films containing biobased additives and studying of abiotic (physical-chemical) and biodegradability in soil and aquatic environments by using different approach. Oxidative degradation behaviours of PE samples were monitored at regular time intervals by Fourier transformed infrared spectroscopy (FTIR), from which the carbonyl index (CO_i) was calculated. Changes in the thermal properties such as melting temperature (T_m) and degree of crystallinity were assessed by using differential scanning calorimetry (DSC), whereas decomposition parameters such as degradation temperature (T_{onset}) were assessed by thermogravimetric analysis (TGA). Soil burial and marine water biodegradation tests of pre-aged LLDPE film samples were carried out in parallel with biodegradable commercial grade materials such as Ecoflex (BASF), Mater Bi (Novamont) and poly(lactic acid) (PLA). For comparison cellulose paper was used as positive control. LDPE samples containing bio-based additives showed a faster thermal/photo oxidation with approaching brittleness and fragmentation as compared to control LLDPE samples. This result was due to the uptake of oxygen concentration by accelerating bio-based pro-oxidant/pro-degradant additives. During the soil burial/marine water biodegradation test, the oxidized LLDPE films containing biobased additives showed CO₂ production (60-65%) as compared to cellulose (reference), Ecoflex and Mater Bi approached 76.3%, 70.1% and 66.2% biodegradation after 180 days of incubation, respectively. These results suggested that environmental factors such as oxygen, temperature, sunlight and living microorganisms (bacteria and fungi) appears to be responsible for the oxo-biodegradation of LLDPE samples containing bio-based additives.

Peter Murphy is the Alaska Coordinator for the NOAA Marine Debris Program. He has been working with the issue of marine debris since 2007, starting with a long-term project assessing impacts caused by hurricanes Katrina and Rita in the Gulf of Mexico, and then transitioning to focus on Alaska marine debris issues starting in 2009. Through projects in both regions and beyond, he's worked across the multi-faceted issue of marine debris to identify impacts and potential solutions that fit the specific needs of the local community. His work includes specific remote sensing and detection technologies on approaches for detecting, identifying and evaluating marine debris.

Education – the future of waste management. Murphy P. (Monday 10 July, Keynote Presentation) Our ocean is filled with items that do not belong there. Tremendous amounts of debris such as consumer plastics, metals, rubber, derelict fishing gear, abandoned vessels, and other lost or discarded items enter the marine environment every day. This influx of litter makes marine debris one of the most widespread pollution problems facing our ocean and waterways, with no part of the world left untouched by its impacts. The solution to this complex problem requires a multi-faceted approach. Although this includes important efforts such as the removal of debris and scientific research, the long-term solution is to prevent new sources of debris from



entering the coastal and ocean environment. Education and effective communication are an important aspect of these prevention efforts. Raising global awareness about the issue, providing opportunities for hands-on local action to change behaviour, and developing curriculum and training educators are all part of achieving the ultimate goal – less debris entering our waterways. By using less, recycling more, disposing of items properly, educating our citizens on the value of our resources, and instilling stewardship as a way of life, we will make great progress toward solving the problem of marine debris. While conditions around the world are different, the underlying principles of the marine debris problem and its solutions will help us to achieve our global goals.

Peter Myles is an international tourism consultant, has a Masters degree in tourism development & management, and is registered with the World Tourism Organization (UNWTO) as a tourism specialist. He works with different project teams around the world. He has written articles for tourism journals, presented papers at international conferences, prepared strategic tourism plans, designed appropriate organizational structures, stimulated tourism enterprise development, conducted tourism research, compiled visitor statistics, and facilitated capacity building training workshops in fifteen countries. After hosting the 6th International Coastal & Marine Tourism Congress in Port Elizabeth, Peter was appointed to the steering committee that founded the International Coastal & Marine Tourism Society. Peter has authored “Maritime Clusters and the Ocean Economy: An Integrated Approach to Managing Coastal and Marine Space,” to be published in September 2017. He has been a guest speaker and participant at two World Ocean Council Sustainable Ocean Summits and four International Coastal & Marine Tourism congresses, and is the current Chairperson of the Nelson Mandela Bay Maritime Cluster.



Corporate responsibility in reducing ocean plastic waste. Myles P. (*Wednesday 12 July, Presentation Parallel Session 1*) With the growing use of marine areas by an increasing variety of commercial interests, there are increasingly complex risks from environmental impacts and conflicts in the use of marine space. The increasingly crowded, multi-use marine environment is being affected by the expanding levels and kinds of commercial activities, e.g. oil and gas, shipping, fisheries, aquaculture, tourism, coastal development, dredging, port development, etc. These impacts are often cross-cutting and cumulative and can have negative consequences on the economy, livelihoods, food security, coasts and communities, affecting the potential growth and sustainability of the ocean economy. The issue of plastic waste leakage into the world’s ocean has attracted global concern, assuming the characteristics of a major epidemic. Plastic is one of the most versatile inventions of our time and has unrivalled application at a material level. But it has become evident that, in the absence of basic waste management and advanced recovery systems, the single-use nature of plastic increases the likelihood that unmanaged plastic waste will reach the ocean, which acts as the planet’s ultimate sink. Plastic has been identified as a major component of marine debris, because of its prevalence in the waste stream and its longevity. Without concerted global action, there could be 1 ton of plastic for every 3 tons of fish by 2025, with at least 80% of ocean plastic originating from land-based sources. It is critical for industries to have a way to understand each other and to work together in addressing their collective “Corporate Ocean Responsibility”. Maritime clusters are defined as a population of geographically concentrated and mutually related business units, associations, public and private organizations, centred round a distinctive economic specialization. This collaboration is essential to supporting the future success of their business and the future success of the overall ocean economy. The best efforts by a single company or even a whole industry sector will not be enough to secure ocean health and productivity into the future. Industry has a role to play in reducing ocean plastic waste. Companies don’t make plastic with the intent of it ending up in the ocean. However, they need to increase their efforts to divert plastic waste from landfills and prevent it from ending up in the ocean. This will require projects that aim to increase recycling rates and divert flexible packaging from landfills. In many coastal cities, local maritime clusters may be the only coordinating body capable of encouraging local industries to support initiatives and projects that substantially reduce plastic waste leakage into the local ocean space.

Lorien Pichegru. Lorien’s research focuses on seabirds foraging ecology and life history traits in relation with environmental conditions and anthropogenic disturbance, using animal-borne miniaturized recorders on several seabird species threatened with extinction. In particular, she focuses on the impact of fishing competitions on the



endangered African penguin in Algoa Bay, with a team of PhD and post-grad students. Lorien obtained her PhD from the University of Strasbourg, France, in 2008, was a post-doctorate fellow at the FitzPatrick Institute at UCT, worked for BirdLife SA and is now a research fellow at the Institute for Coastal and Marine Research at NMMU.

1. Seabirds and plastic debris. Pichegru L, Ryan PG. (*Monday 10 July, Presentation Parallel Session 1*)

Plastics are an essential part of our lives. We produce over 260 million tons of plastic each year, from eight per cent of the global oil production. But plastic litter also accumulates worldwide, with serious implications for natural systems. Among birds, waterbirds and seabirds are particularly at risk. Here we review recent research on the impacts of marine litter on seabirds, from entanglement to ingestion. Entanglements are generally caused by derelict fishing gear, but other anthropogenic material such as ropes, balloons, plastic bags, sheets and six-pack drink holders can also cause entanglement. Hundreds of thousands of marine birds are known to perish every year in fishing gear, while records of entanglement exist for a quarter of all existing seabird species. Ingestion of plastic by marine organisms is less visible than entanglement, but still has been recorded in half of the seabird species worldwide. Ingestion can be accidental or intentional, with for example individuals confusing prey and plastic. Once ingested, debris may puncture stomach walls or block the gastro-intestinal tract, leading to the animal's death. Chemicals can also penetrate cells and interact with biologically important molecules, possibly changing behaviour, inducing liver toxicity or endocrine disruption. The impact of marine debris remains generally underestimated, but is of growing concern. There is an urgent need for data collection at scales relevant to management, and to develop interdisciplinary research and management partnerships to limit the release of plastics into the environment and curb the future impacts of plastic pollution.

2. Beach clean-ups and recycling initiatives. Lorien Pichegru L, Binning K, Douglas-Jones T, Douglas-Jones I. (*Poster Presentation*)

The Wildlife and Environment Society of Southern Africa (WESSA) Algoa Bay Branch initiated a series of monthly beach clean-ups in 2017 in Nelson Mandela Bay, on South Africa's south-east coast. The aim of these clean-ups is to remove rubbish, especially plastic, from the beaches thus preventing it entering the marine environment, and to mobilise general public awareness and personal action to the reduction of waste and recycling initiatives. WESSA Algoa Bay Branch also actively promotes recycling and encourages members of the public to recycle by highlighting several key recycling initiatives. In this poster, WESSA will provide feedback on the beach clean ups to date as well as information on various recycling initiatives in Nelson Mandela Bay.

Annabé Pretorius studied Polymer Science at Stellenbosch University and subsequently gathered 30 years of experience in the South African plastics industry. After CSIR, AECI and the Plastics Federation of SA, she formed her own company in 2007, Plastix 911, doing some fault finding, helping with material selection and assisting new entrants into the industry. She is contracted for a couple of days a month to SAPRO (the South African Plastics Recyclers Organisation) as well as PlasticsSA to assist with technical enquiries. She completed a number of surveys on plastics recycling and plastics converting. Annabé often participates on judging panels as her theoretical knowledge, underlying experience and passion for anything plastic adds value to the judging process in general.



Plastics Recycling – the only solution? Pretorius A. (*Wednesday 12 July, Presentation Parallel Session 3*)

Litter – on land or in the sea is a problem. The legislators gazetted the National Environmental Management Waste Act in 2008. The waste hierarchy has a serious impact on the plastics industry in South Africa, and mainly the plastics packaging industry. Plastics are an integral part of our daily lives and are interwoven with just about every other industry. Despite the normal manufacturing challenges, the plastics industry is also reducing plastics to landfill, and there are many success stories. Despite all of this, plastics still have a huge bad boy reputation. SAPRO is representing the plastics recycling industry, and South Africa is amongst the best in the world in taking post-consumer waste to re-process it into raw materials as an alternative raw material to manufacture new plastic products. End-of-life products are picked from landfills, industrial and commercial sites to be sorted, compacted and transported to plastic recyclers or re-processors. The three polyolefins and PET are the top polymers mechanically recycled in South Africa. Recycling rates hover around the twenty percent and need to increase to make a substantial difference in the way people think about waste, about recycling and about plastics in general. Various programs are in place to stimulate recycling, regulatory, consumer

awareness and *Design for Recycling* principles at brand owner level. Whilst the supply side is being addressed, some serious development work is required on the demand side to ensure a constant pull action. This needs to start with the quality and consistency of the recycle. It needs more products with recycled content, more innovative applications and serious commitment from the consumers, plastics converters and brand owners to engage in a circular plastics economy. Is plastics recycling the only solution to address man's petrochemical dependence, unsightly litter, marine waste and get us to *Zero plastics to landfill by 2013*?

Jaisheila Rajput is Founder & CEO of TOMA-Now | Tomorrow Matters Now, value chain specialists that focus on developing the green economy. Jaisheila is passionate about transforming the way we do business by developing practical and comprehensive solutions that have the biggest value with long-term benefits and impact. Jaisheila obtained a PhD in Chemistry from the University of Cape Town. From the beginning, she has leveraged her research and innovation capabilities into developing practical, industry-relevant solutions. She has a career spanning over a decade in large corporates in the automotive, chemicals and construction industries. Her rich background includes technical, management systems, strategy and sustainability. She has worked in several countries including South Africa, Germany and Hong Kong. Jaisheila brings a fresh global perspective to the development of solutions for companies doing business in Africa.



Beyond recycling to new viable source materials. Rajput J. (*Wednesday 12 July, Presentation Parallel Session 2*) The potential exists to have a full scale recycled resource circular economy - but what is stopping us? What are the challenges and barriers that need to be overcome? What is the actual situation with our waste and how is this effectively being managed or unmanaged? Can marine plastic waste really be harvested as a viable input for industries, securing our marine resources while becoming an actual cost competitive commodity? Developing a waste economy through a recycling value chain can have significant social, environmental and economic impacts. The recycling value chain can create significant opportunity for economic growth, reduced environmental footprint and a means of addressing consumer concerns. Waste management and the use of our discarded resources has become a topic of increasing importance globally and in particular, in South Africa. The focus is on how these resources can effectively be used as raw materials. We have worked with several industries ranging from the development of a waste economy to value chain development for the purposes of guaranteed recycled content raw material supply. The presentation will focus on essential criteria needed to develop an effective waste economy as well as how to ensure guaranteed supply of recycled content - both are key components towards building a circular economy in Africa

Deborah Robertson-Andersson is Senior Lecturer, Marine Biology, University of KwaZulu Natal, where she co-founded the MACE lab with the effects of microplastics on Durban marine life being one of the lab's research thrusts. Her research interests include the mass culture of seaweeds; the ecologically-balanced integrated mariculture of abalone, fish and seaweeds; novel approaches for sustainable mariculture; the socio-economic impacts of abalone cultivation in South Africa, microplastics, marine ecotoxicology and conservation education. Previously, she researched seaweed-based feed for abalone, investigated the potential for a liquid seaweed extract in increasing crop yields and using seaweeds as biofuels, and studied jellyfish reproduction. In addition to a long list of publications and conference papers, Deborah has advanced diving qualifications, is a SAYRA-qualified Offshore Yacht Master, and has sailed three quarters around the world.



1. Booms, Bins and Bags: the B3 solution to the BIGA problem! Robertson-Andersson D, Caws G, Moodley G, Fokkens B. (*Tuesday 11 July, Parallel Session 1*) Books, Ideas and General-knowledge does not necessarily lead to Action. This is the "BIGA" conservation problem. Although most people know that plastics are bad, this doesn't stop us producing close to 300 million metric tons per year of mostly single use plastic items, 80 % of which end up being discarded and 80 % of that ends up in the oceans. Durban Solid Waste removes 1 ton of plastic a day from the Durban mile. However, when MACE Lab and Roxy's SCUBA School run beach cleanup operations, irrespective of the person's age and season, the average amount of plastic picked up from Vetches Beach is 1.1 kg per person per hour. This litter is

collected at low tide after DSW beach clean-up has occurred. The composition of this waste is different to that collected by DSW. The greatest number of items collected are straws, ear buds, plastic bottle tops and smaller broken plastic pieces. This is due to targeting of these smaller items by volunteers. Targeting plastic pollution in river systems may considerably reduce the amount of plastic in the oceans. DUCT working on the Umhlangane and Umgeni rivers removes 300 bags of mostly PET plastic bottles per low rainfall months but this increases to 1300 bags with just 40 mm of rain, through boom trapping and collection from river banks. If these plastics get to the beach they will breakdown to form microplastics so DUCT together with MACE lab and Paddle for the Planet (P4P) have launched an initiative called Booms, Bins and Bags that tackles plastic pollution in river systems. This is a pilot project and it is hoped that if successful can be rolled out to include other river systems nationwide to significantly reduce the amount of plastic litter entering the oceans.

2. Microplastics. Robertson-Andersson D. (Poster Presentation) Microplastics are plastic particles with diameters < 5 mm, and are derived from industrial production for their use in cosmetics and household products, as well as from the breakdown of larger plastic items. Microplastics in marine environments raise increasing concern as they are available for ingestion by important lower trophic level organisms. Additionally, microplastics may potentially be contaminated with toxicants such as heavy metals and Persistent Organic Pollutants (POP's) present in the ocean, which may bioaccumulate in the marine food web. Sea urchins are considered to be important ecosystems engineers, as they have the ability to modify the marine ecosystems in which they live. Through transforming biotic and abiotic materials from one physical state to another, sea urchins create habitats for other marine organisms and control biodiversity. Sea urchins are greatly threatened by microplastic pollution as there are potentially two routes through which these organisms can take up microplastics. *Tripneustes gratilla*, a sea urchin species inhabiting the rocky shores along KwaZulu-Natal, takes up microplastic fibres into its water vascular system through its madreporite pores. It has also been observed that seaweed, which is the primary food source for sea urchins, can become contaminated with microplastics. It is currently being investigated whether the uptake of various concentrations of microplastic fibres will have an effect on the water vascular system of *T. gratilla*. The investigation also aims to determine whether microplastic fibres will be taken up by *T. gratilla* through feeding on microplastic contaminated seaweed.

Motshabi Sibeko, originally from the Free State, is one of South Africa's young up and coming researchers. She has a BSc degree in chemistry, physics and biology, a BSc Honours in polymer science, a Masters degree and PhD in polymer science. She moved to Port Elizabeth in 2016 and is currently doing her post-doctoral studies at NMMU. She is also an ambassador for the Charlotte Manna Maxeke Institute (CMMI).



Environmental analysis of pneumatic tyres. Sibeko M. (Wednesday 12 July, Parallel Session 2) Tyres are one of the most complex engineered rubber materials ever produced; their invention has changed human lives for better and for worse. Over the years, landfilling and open dumping were the most common methods of disposing waste tyres. These methods have declined because tyres are non-degradable, bulky and take up valuable space. Their accumulations in massive stockpiles serve as potential health and environmental hazards due to the possibility of fire breakout, with high emissions of toxic gases. The potential of tyres as breeding grounds for vectors due to their ability to trap water is also another concern. The threat of tyres to the environment and health is not only faced at the end of their life cycle; concerns have been made regarding the leaching of tyre constituents when they are used on roads and in other applications such as in children's playgrounds and synthetic turf fields. Tyres contain heavy metals, polycyclic aromatic hydrocarbons and volatile organic components that can easily be released to the environment. The VOCs and some of PAHs are considered potentially toxic, even carcinogenic. Furthermore, abrasion of tyres produces debris containing tyre constituents that may end up in vegetation and water streams through rain. The use of tyre materials as artificial reef habitats or breakwaters is also a threat to aquatic organisms due to the possible leaching of heavy metals into water over time. REDISA in partnership with NMMU is working on developing an environmental rating system for tyres, which will rate tyres according to the type and amount of chemicals, especially heavy metals and PAHs, found in tyres in relation to the amount allowed by the adopted EU regulations. This study explores this potential rating system and its potential impact on the direct economic incentives, over and above encouraging more environmentally sustainable products.

Henry Roman. A doctorate in Biotechnology, specializing in the bioremediation of acid mine drainage, was followed by postdoctoral research fellowships from Rhodes University, the CSIR, and the NRF. Roman has 12 years' experience in SA's national system of innovation, six of these at the Department of Science and Technology (DST), and is a respected advisor on green economy policy. He led the development of two related national roadmaps to guide research, development and innovation in water and in waste, initiated the first degree in waste management in South Africa, was instrumental in establishing the Water Technologies Demonstration Programme, WADER, and commissioned the first Green Technology Landscape Report for SA. He sits on a number of national steering committees, and is South Africa's National Designated Entity for the Climate Technology Centre and Network, assisting with climate technology transfer from developed countries to South Africa. He served as President of the World Association of Young Scientists under UNESCO from 2009 to 2015, is a founding member of the Young Water Professionals-SA and is the current Chair of the International Water Association-SA.



Capacity building in the waste sector in South Africa. Roman H. (Tuesday 11 July, Parallel Session 1). The Sustainable Development Goals (SDGs) are on every environmentalist's and industrialist's mind. SDG 12: Responsible consumption and production, coupled with SDG 14 and 15: Life below water and Life on Land, respectively, have relevance to the waste sector. When the Department of Science and Technology (DST) embarked on the process to develop the Waste Research, Development and Innovation (RDI) Roadmap, what emerged strongly from the sector was the need for skills. We then commissioned a study to obtain an understanding of capacity building programmes in place at that time, and this paper will unpack our findings and the initiation of the first degree in Waste Management in South Africa.

Allison Schutes serves as a senior manager for the Trash Free Seas Program at Ocean Conservancy where she oversees the annual International Coastal Cleanup, the world's largest, single-day volunteer effort on behalf of the ocean. Allison works to engage individuals and communities in the issue of ocean trash through education, outreach and the belief that we all can make a difference. Prior to working at Ocean Conservancy, Allison worked five years at an aquarium, managing marine education and conservation programming. Allison received a Bachelor of Arts in Psychology from Rollins College and a Master's Degree in Environmental Planning from the University of Florida. Allison has extensive speaking experience both domestically and at international forums. Experience includes: Ocean Talks, Dublin, Ireland; United Nations Environment Programme Northwest Pacific Action Plan Workshop, Yantai, China; Nonprofit Technology Conference; Annual Symposium on Sea Turtle Biology and Conservation; Worldview, NPR: WBEZ Chicago; International Marine Conservation Congress; Monterey Bay Aquarium Ocean Plastic Pollution Summit; National Marine Educators Association Annual Conference; Southeast Regional Sea Turtle Meeting.



The International Coastal Cleanup: three decades of citizen action for the ocean. Schutes A. (Monday 10 July, Plenary Presentation) Plastic debris is now distributed throughout the world's oceans: from the ocean surface to the deep sea, from the equator to the sea ice in the Arctic, from the high tide mark to the farthest reaches of the open ocean. Nearly 700 marine species have been affected by the estimated eight million metric tons of plastic that enters ocean yearly from land based sources. This threat is not new however, and Ocean Conservancy has been engaged on the issue for more than three decades through the International Coastal Cleanup (Cleanup). Since 1986, citizen scientists around the world have come out on a single day in September for the purpose of ridding beaches, waterways, and the ocean of marine debris. Over the past 31 years, more than twelve million Cleanup volunteers have removed 230 million pounds of debris from more than 395,000 miles of coastline and waterways in 153 countries and locations. Critical to the Cleanup's success has been the global network of more than 140 Cleanup Coordinators who represent an influential community of marine debris thought leaders, and who inform and influence pivotal management and regulatory decisions in their respective geographies. Furthermore, the thirty year debris dataset amassed through Cleanup has been utilized around the world in seminal publications on marine debris and has been used to inform policies that eliminate the most persistent forms of plastic debris at the municipal, state, and national levels. There

is no single solution to ocean plastics; success will ultimately require a comprehensive approach. This means continuing to leverage and grow the extraordinary network of Cleanup Coordinators and volunteers around the world will remain integral to the solution while concurrent efforts to minimize and manage plastic pollution expand globally.

Kaveera Singh. MSc Marine Biology Candidate. Supervisor: Dr Deborah Robertson-Andersson. Co-supervisors: Gan Moodley and Judy Mann-Lang (SAAMBR). My project is a trans-disciplinary study, which endeavours to link learning styles to conservation education, forming a novel method of science communication. Building from my Honours research, I am attempting to design more effective marine conservation messages through the different illustrations according to the visual-aural-read/write-kinesthetic (VARK)



learning styles. Questionnaires will be used to test different factors that contribute toward nature relatedness, connectedness and pro-environmental behaviour. Scientific findings need to be translated into simple messages that contain the correct pitch and terminology, which contribute to effective conservation

Digital conservation: scientists' portal to connecting with the public? Singh K, Singh S, Moodley G, Robertson-Andersson, DD. (Tuesday 11 July, Parallel Session 1) Effective communication of conservation issues has been identified as a major barrier between scientists and the general public. This has led to lack of social awareness and conservation behaviour. Scientific knowledge is usually presented in structured formats containing scientific jargon that is both inaccessible and incomprehensible to the general user. To overcome this barrier, one needs to change conservation approaches. Knowledge-transfer and connectivism are educational frameworks that could be used. Knowledge-transfer is the dissemination of knowledge, ideas, skills, expertise and assets, while connectivism creates a lasting changed state (mental, emotional, psychological) focused on connecting individuals to information sets by using digital technology. Social media is used by 80% of South Africans to communicate. Conservation memes (interactive pictures which require individuals to respond to a call-to-action) pitched with the appropriate terminology were uploaded onto three platforms (Facebook™, Instagram™ and Twitter™). Results showed that Facebook™ was the most effective platform and that meme design plays a vital role in experiential learning. YouTube videos on biodiversity conservation were analysed for factors contributing to message impact, with the highest ranked factors being the absence of scientific jargon and pre-teen level of understanding. Two videos (one which included the highest- and lowest-ranked criteria) were compared using Likert Scale questionnaires to test the efficacy of message transmission. Effective science communication is not only about publication of scientific journals, but must be coupled with education methods to enhance knowledge transfer, which ultimately promotes positive alterations towards conservation-inclined lifestyles.

Mandlakazi Skefile is Chief Executive Officer of Nelson Mandela Bay Tourism (NMBT) and is a passionate tourism industry advocate. During her seven-year tenure as NMBT CEO, she has been deeply influential in positioning the city as an alternate destination to mainstream cities in South Africa. She has actively lobbied for and supported major city events such as the 2010 FIFA World Cup, Ironman South Africa, IRB World Series Sevens rugby tournament, a growing concerts portfolio, and the naming of the city as the Bottlenose Dolphin Capital of the World. She has also actively participated in bringing to life global partnerships, sister city agreements, and tourism trade and investment opportunities to the benefit of the city, and is a major proponent of sustainable and responsible tourism. She is an accountant by trade and previously worked as NMBT's Finance and Accounting administrator.



Waste not, want not: Economic opportunities in waste management for the African tourism and hospitality industries. Skefile M. (Wednesday 12 July, Parallel Session 3) Waste is an inevitable part of the human condition, but how it is harnessed is a matter of design not destiny. In other words, while we produce waste, what we do with it is a choice. For the travel, tourism and hospitality industries, the opportunities are significant. At the core, however, lies a daunting, but doable methodology: culture change. This requires consistent, collaborative approaches to daily practices ensuring change filters into every system – from recycling to lobbying for waste-to-energy plants or waste incentives; and from

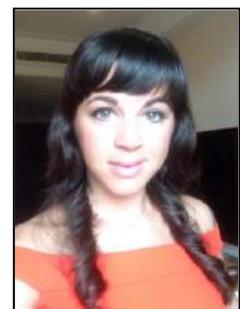
being a responsible tourist to encouraging responsible tourism. Ultimately, the benefits outweigh costs and investment and there is a strong economic case for better waste management in the tourism industry. First, it makes environmental sense. Second short-term investment creates long-term benefit – one just needs to look at solar and grey water systems to understand practical cost savings. Third, there are many spin offs into other sectors and potential for small business growth. And fourth, there is a need to live and operate within means as poverty deepens and the global population pushes the boundaries of the earth's capacity to cope with humanity's demands on the environment. The tourism industry has considerable navel-gazing to do, not only because of the size and impact of the industry, but because of its power and influence. Destinations that not only promote liveability but sustainability will be the destinations of the future as tourists seek authentic experiences that minimize the impact of tourism – and reduction is a shared responsibility. This presentation considers the myriad of opportunities – business, environmental, educational, economic, social and technological – offered by better waste management specifically in the African tourism industry. It also looks at current and potential solutions with a future outlook against global benchmarks and minimum standards for responsible tourism; and best practices from leading economies both on the continent and beyond.

Steve Trott is a marine zoologist and the Projects Development Manager at Watamu Marine Association in Kenya. WMA runs sustainable tourism and ecotourism projects; community based waste management and recycling enterprises and marine conservation and research programs. Steve's current focus is on finding innovative solutions to the growing marine debris problem which can be of financial benefit to coastal communities in Africa. These include developing plastic and glass recycling and upcycling small business enterprises.



Community Based Waste Management and Recycling Enterprises – Watamu, Kenya; Watamu Marine Association. Trott S. (Wednesday 12 July, Parallel Session 3) The enterprises originated out of awareness and a recognised need to tackle the problems and threats caused by plastics, and other marine debris pollution, impacting the Watamu Marine Park beaches and marine environment. This initiative, developed by Watamu Marine Association brings stakeholders together in a collective effort to reduce these impacts. The purpose is to help provide clean beaches and a solid waste free environment for the benefit and welfare of the local community, the local tourism industry, and the environment. Small business enterprises have been created from recycling, reuse and upcycling of plastic and glass waste which are sourced from beaches, hotels and residents. A plastic recycling facility operates a plastic crusher machine and provides part time employment to 25 local community group members as beach cleaners, waste collectors and recyclers. Their income is provided by sales of processed plastic to recycling industries in Mombasa and through Watamu tourism industry sponsorship. Art and crafts are also created from plastic and other marine debris and sold in local shops and hotel boutiques. Another innovation is upcycling glass and plastic bottles to make building blocks for construction. The enterprises are an example of successful cooperation between community organisations and the local tourism industry in creating waste recycling value chains. The results are cleaned-up beaches, reduced environmental threats, and employment opportunities for women and youth. The enterprise is already receiving national and international recognition and acclaim and is set to become a regional showcase for a combination of best waste management and environmental practices and sustainable tourism. By creating dynamic waste recycling value chains, local communities in African coastal resort towns can play a significant role in waste management and reducing marine pollution in their local area.

Heather Troutman. My background is in technical urban planning and environmental science, with specialization in sustainable development and resource efficiency. I am currently working with the United Nations Development Programme Ghana National Office to provide rapid and drastic improvement to the plastic pollution crises by creating a vibrant and resilient market for waste plastics, by incorporating them in infrastructure projects. We believe that base-of-the-pyramid economic solutions are most promising for near-term solutions in developing economy cities because they do not require much, if any, (hard to come by) capital investment or legislative reform. Further, we are using this highly emotional topic (plastic pollution) to create opportunities for



forma | integration of the informal waste picking sector, which offers numerous benefits for the public, private and informal sector

Waste valorization as a strategy to sustainably manage plastic wastes in developing economies.

Troutman H. (*Wednesday 12 July, Parallel Session 1*) The goal of this report is to summarize progress in Ghana for creating value for reusing waste plastic, thereby reducing marine pollution. Most global plastic marine debris comes from developing-economy cities with high rates of informality, lagging infrastructure, insufficient tax-base for municipal services, rapid population growth and projections for sharp economic development. These attributes result in exponential growth in waste plastics. The UNDP Ghana and UNDP Innovation Facility African Branch are turning such city attributes into strategies to increase waste plastics collection and reuse to stimulate socioeconomic development, and to prevent movement of waste plastic from the landscape into marine environments. Waste plastics can be converted into raw material inputs for the manufacturing of high-performing, cost competitive, sustainable building products that have superior quality and economic advantages compared to traditional materials. Applications include materials for road and building construction, several architectural accessories, and production of clean-burning fuel. A mix of six small- to medium-scale manufacturing facilities could consume 88% of Accra's annual waste plastics, nearly 150 000 tonnes per year. There is now sufficient market demand in Ghana for high-quality, low-cost building materials to establish manufacturing facilities around the country that create jobs, stimulate socioeconomic development, and reduce flow of waste plastic into marine environments.

Chandru Wadhvani. Currently Extrupet's Joint Managing Director, Chandru is a BSc Business Studies graduate from City University in London, UK, who has been involved in the Textile & Plastics industries for the last 27 years across the African continent. 16 of those years have been spent in South Africa as part of Africa's leading PET and HDPE bottle recycling company, Extrupet.



The role of technology. **Wadhvani C.** (*Wednesday 12 July, Plenary Presentation*) While the issue of plastic waste has become increasingly emotive, the sentiment around ocean waste truly runs deep (excuse the pun). What we need to guard against is failing to answer upfront the most basic of demands for sustainable recovery and recycling initiatives – “Collect and do What?” It is not uncommon for new initiatives globally to be launched without considering adequately the full value chain and its intrinsic dynamics. Many a time, these dynamics are not conducive to successful implementation of recovery and recycling programmes, causing many initiatives to fail even before they have started. Technology has a key role to play in this regard. The difficulties associated with recycling many plastics have progressively reduced in scale over time, leading to increasing volumes of waste now being recycled. There are however some challenges that remain, and to not address these will mean that some waste harvested from the oceans will end up being landfilled, a farcical situation indeed. To take a further step back, advancements in technology for producing plastic packaging can be the “prevention” rather than the “cure”. To design and engineer packaging with the full life cycle of the packs analysed before they end up on our shelves is to ensure that packaging never becomes waste. For those who do not adhere to these principles, especially where technology has been used to engineer ridiculously complex packs, then the approach needs to change. It is already possible to identify which packs are destined for our landfills and oceans purely from the design and engineering utilized. Technology is truly a wonderful tool at our disposal, and the knowledge that invention continues to take us to realms where we could not have acted before gives us hope that our solutions exist if we apply technology appropriately and adequately.

Chris Whyte is the Managing Director of USE-IT which creates thousands of jobs in the recycling sector, leveraging 15 times their funding in landfill savings and commercial development. USE-IT has created a model for green economic development and innovation in South Africa that works. Dealing in every aspect of the waste stream, USE-IT explore, invent and create opportunities in waste beneficiation that touch on waste management, water management, infrastructure, energy, social upliftment, environmental benefit, economic development, low-carbon development, enterprise development and skills development – all key aspects of sustainability. USE-IT is a multi-award-winning NGO that is a leader in sustainability, innovation in waste beneficiation, green economic



development and circular economic development.

Actions industry should be taking in Africa: time for innovation and action! Whyte C. (*Wednesday 12 July, Plenary Presentation*) There is little doubt that mankind has engineered its way into the global mess that we have created for ourselves, but the Green Vision is that we are clever enough to engineer our way out of the same mess to a more restorative and even regenerative sustainable future. We are starting to see the opportunities coming to light internationally in the global battle to move from our linear thinking model to one kinder to the planet. Unfortunately, in Africa and Asia, whilst blamed for the worst of the global “leakage” of this debris to the marine environment, we are also the slowest on the uptake to see the opportunities. We need to get out of our comfort zones and apathetic “business as usual” mindset to grasp these opportunities. We need to firmly shake our politicians and lawmakers to drive an enabling environment where we use the waste in our back yards to drive the engines of development and growth. We have the greatest need, and yet diminutive desire as we starve in expectant lines for aid, handouts and bailouts. We in Africa need to take the opportunities before us and rejuvenate the roar that is the power within us. We should be inspiring leaders and embrace the Ubuntu of Africa driving innovation at community level and showcase true circular economic development for the rest of the world to follow. Break down barriers, boxes and silos and embrace the geometry of circularity.

Chris Wilcox. Originally from the USA, with a Masters degree and a Ph.D. in ecology and conservation biology, Chris has worked with NGOs, government and private enterprise over a 23-year career as a professional biologist to develop cost effective solutions to natural resource management problems. Currently a research scientist with CSIRO Marine and Atmospheric Research in Hobart, Tasmania, he co-leads two large research programs, focused on the ecological impacts of marine debris and the development of analytical tools for tackling illegal, unreported, and unregulated fishing.



Large scale monitoring design for marine debris - developing robust and flexible approach to support policy responses. Wilcox C, Hardesty D. (*Tuesday 11 July, Plenary Presentation*) Pollution of coastal areas and the marine environment by plastic materials is a rapidly increasing problem. It is estimated that 8.4 million tons of plastic enters the ocean from land each year. One key to effective responses to this problem is a clear understanding of the sources, distribution, and dynamics of the plastic entering marine systems. Globally there are a wide range of different approaches to gathering data on this issue, including sampling in the water column, sediments, coastal areas, and inshore. Our research team has conducted two large scale monitoring projects, one attempting to estimate the load of debris on the coast of the Australian continent and a second making a similar estimate for the entire US coast. In both cases we have used a mix of volunteer data from cleanups, semi-structured survey data, and data from a very strictly designed stratified random survey. We will present results from these large-scale estimation efforts, and discuss key drivers in the distribution of debris in both contexts. We will also discuss issues arising with each of the data sets we used, and some lessons learned about the tradeoffs between volunteer cleanup data and designed surveys. The talk will conclude with suggestions for other organisations and countries considering implementing monitoring for marine plastic pollution.