Resource Efficiency and Recycling Networking of plastic debris- Case of PICs

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Pacific Island Countries (PICs) are facing critical challenges in managing increasing and diversifying wastes due to changing lifestyle and concentration of the population in urban areas. Plastics in the marine environment are of increasing concern because of their persistence and effects on the oceans, wildlife and potentially humans (Jambeck et al., 2015). Mismanaged plastic debris can enter into the ocean via inland waterways, wastewater outflows and transport by winds or tides in PICs. It is therefore urgent to establish a sustainable solution to avoid the island countries from being progressively buried in wastes. Recycling provides opportunities to reduce oil usage, carbon dioxide emissions and quantities of waste requiring disposal. The outcome documents -SIDS Accelerated Modalities of Action (S.A.M.O.A.) pathway and Regional 3R Forum in Asia and the Pacific, identify and emphasize the various challenges and issues of resource efficiency, recycling networks in small island developing states, and highlight to promote reduce-reuse-recycle +"Return" which means return of recyclable materials out of the island countries. This article highlights the strength of regional resource circulation and recycling networks to secure the sustainable resource efficiency, improve economic impact and reduce health and environmental risks in PICs.

Keywords: Pacific Island Countries (PICs), Plastic debris, Recycling, Resource efficiency, Regional 3R Forum in Asia and the Pacific.

1 Introduction

Consumption of resources and generation of various wastes in the provision of tourism services in Pacific Island Countries is the biggest impact of the sector. Plastics have made significant contributions in every field of human activity such as agriculture, transportation, manufacturing and packaging of household and electrical items and so on. Packaging is one of the important uses of plastics. Plastics are inexpensive, lightweight, strong, durable, corrosion-resistant materials with high thermal and electrical insulation properties. Plastics have contributed in creating a sustainable, hygienic, energy efficient, cost effective and environmental friendly packaging system (Siddiqui and Pandey, 2013). Plastic debris can be harmful to wildlife and to human health and it has the potential to transport organic and inorganic contaminants (STAP, 2011).

2 What is plastic debris?

To begin to address the problem of plastic debris in the context of PICs, we must first understand what is referred to as plastic debris and its composition. Marine debris is defined as "any persistent, manufactured, processed or solid material discarded, disposed of or abandoned in the marine and coastal environment." (UNEP, 2009). In the past, there have been several attempts to define what marine debris is. One of the earliest references comes from a 1984 workshop on the Fate and Impact of Marine Debris (Shomura and Yoshida, 1985) as a result of a request from a 1982 from the Marine Mammal Commission to the National Marine Fisheries Service to examine the impact of marine debris. Marine debris is made up of several different components; plastic, being the largest in quantity, glass, metal, paper, rubber, wood and cloth. The United Nations Convention on the Law of the Sea (UNCLOS) designed what is referred to as the Informal Consultative Process, which was mandated by the General Assembly to address the theme of "marine debris, plastics and micro plastics" at its 17th Meeting held between 13th and 17th June, 2016 (UN Report, 2016 and UNEP, 2016).

3 Problem and Impact of Plastic Debris

3.1 Ecological Impact

Entanglement/Entrapment: Marine debris can pose serious threats to marine wildlife through entanglement. The entangled animals can starve due to limited movement, suffer lacerations, suffocation and eventually, death. Lost or abandoned traps continue to capture both target and non-target animals.

Ingestion: Marine animals end up ingesting marine debris; small or degraded plastic items. The most common occurrence is sea bird ingesting small plastics as they forage for food on the ocean surface (remember, plastic floats). Fish and sharks have also been documented to have small particles of plastic in their systems. This ingestion has resulted in damages to the mouth, stomach and digestive tracts of several species. Some debris can cause blockage in the oesophagus, preventing intake of food or liquid, resulting in starvation, nutrient deficiency and possible death.

Habitat destruction: Evident alteration, degradation and destruction of the habitat of different organisms. Heavy marine debris can be swept to sea and sink to the bottom, covering organisms that reside at the bottom and in turn, destroying their environment as well as the natural order of foraging for food within that ecosystem.

Transport of chemicals and food chain implications: Some plastics have resulted in the higher concentration of environmental pollutants present in the aquatic environment, for example, polychlorinated biphenyls (PCBs) and organochlorine pesticides. Post-consumer plastic fragments collected in the Pacific Ocean tested positive for persistent organic pollutants. Chemical contamination poses immediate threats to terrestrial food webs and the aquatic environment.

Introduction and spread of invasive species: As a result of human execution. Floating marine debris are a major factor in the long-distance transport of invasive species. They can hold large communities and ferry them to far distances where they can then have a negative impact on the native species. This can result in changes to habitat structure, ecosystems and loss of biodiversity.

3.2 Economic Impact

Marine debris affects tourism greatly. As such, marine debris discourages tourism and greatly affects the economy of affected regions which rely heavily on tourism. It also affects the fishing industry and the seafood business. Lost lines or nets end up capturing organisms. This is known as ghost fishing. Crabs, fish and other sea animals are caught in these forgotten nets and traps. This has an overall effect on the fishing industry, in terms of volume of creatures caught and revenue generated. Marine debris causes pollution. People are less inclined to purchase and consume seafood captured from polluted waters. Marine debris are also costly to remove. It costly and the affected areas may not have the finances to carry out consistent clean up exercises.

3.3 Social Impact

Marine debris lowers the intrinsic, social and aesthetic value of coastal regions and marine environments. None-use and option value are reduced and at the same time, marine debris is a great eye sore as the beauty of an area is greatly reduced, along with their property value.

3.4 Human and Health Safety

Marine debris causes entanglement of the propellers on boats and other sea vessels. This in turn causes those on board such vessels to be stranded. Being stranded at sea is a big safety issue. Divers and swimmers are exposed to the risk of entanglement or suffocation from marine debris such as abandoned fishing lines or plastic bags dumped in the ocean. In-land, irresponsible disposal and management of waste and debris such as medical waste (syringes) and glass among other things can cause cuts and abrasions which may lead to infections. Contamination of water with debris from personal hygiene products, such as condoms causes water pollution and poses great health risks and hazards for the public.

4 3R (Reduce-Reuse-Recycle) approach

Resource efficiency refers to “the ways in which resources are used to deliver value to society and aims to reduce the amount of resources needed, and emissions and waste generated, per unit of product or service” (UNEP, 2011). The practice of 3R, resource efficiency measures and life cycle approach can create opportunities for mainstreaming green economy in the tourism industry in small island countries, including the green investment in the tourism sector (Co-Chair’s summary of Sixth Regional 3R Forum in Asia and the Pacific, 2015). Regional forums and conferences on the development of SIDS have resulted to outcome documents - SIDS Accelerated Modalities of Action (S.A.M.O.A.) Pathway recognizes the sustainable economic growth in island countries. The outlines includes the seven actions, which are development and implementation of policies that promote responsive, responsible, resilient and sustainable tourism, diversification of sustainable tourism to include ecotourism, agro-tourism and cultural tourism and participatory approach in employment opportunities with particular regard for protection of natural environment and cultural heritage (SAMOA Pathway, 2014).

There are five steps in the hierarchy of recycling systems: Waste Reduction, Pre-consumer Recycling, Product Re-use, Primary Recovery and Secondary recovery. In Waste Reduction, focus is on Qualitative and Quantitative waste reduction and restriction on certain products and processes. In Pre-consumer Recycling, the focus is on industrial recycling at the source within the production process. At the Product Re-use stage, focus is on Returnable, Re-use and repairs and refurbishment. In Primary Recovery, secondary materials to replace virgin raw materials. Finally, in Secondary Recovery, calorific value of waste to produce waste-derived fuel, heat and electricity (Gandy 2003). Public-private-partnership (PPP) is an important technological consideration in rolling out 3R practices for local implementation, green employment and resource efficient development.

5 Conclusion and Recommendation

3R’s- reduce, reuse and recycle are widely advocated to reduce the quantities of plastic debris and consider the reuse of product and redesign for effective recycling. Resource efficiency and recycling networking are paramount to sustainable development in PICs.

Improper handling, processing and disposal of solid, hazardous and toxic wastes result in plastic and other waste debris along coasts and running off to the oceans, micro-plastics in the oceans, and leaching of chemicals from plastic containers, leading to the destruction of corals, reefs and marine life. Recycling and re-utilization of plastic debris has lead to a reduction in the use of virgin materials and energy, thus also a reduction in carbon dioxide emissions.

Figure 1 shows generation rate with the current (2010 year) and future estimation of plastic debris in 2025 year of PICs.

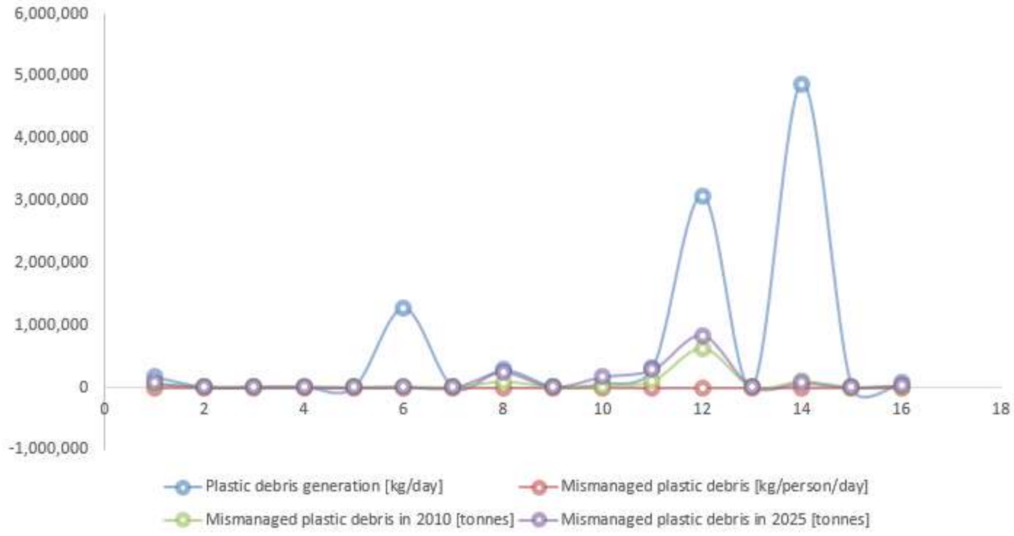

Figure 1: current (2010) and future (2025) prediction of plastic debris in PICs

Source: Data collected from Jambeck, 2015

Coming up with recommendations to tackle the problem of plastic debris in PICs involves tackling the issue of recycling plastic and greatly depends on cooperation and education. Recycling is one of the most important practices for plastic debris. Each PICs and developing country have its own unique features, strengths, needs, values and inspirations that planning 3R initiatives need to consider in light of sustainable and resource efficient development. There should be an increased level of global, regional, national and individual action if we are to tackle this menacing problem. Legislation and policy should take into account socioeconomic factors as well as environmental sustainability, protection and development initiatives so as to greatly reduce marine debris, plastics and micro plastics. Sustainable consumption and production tools, policy, approach and technical solutions are available for adoption and adaptation to local conditions. Measures should be coupled with regulatory and financial mechanism from the government who can support the implementation of 3R as an economic industry and mainstream sustainability across related economic and tourism sectors in PICs.

Great research needs to be done to help us better understand our present situation. Some research topics that may be helpful include: Production of truly biodegradable polymers that meet ASTM standards for biodegradation in the marine environment, Research and Development of at-sea detection and removal protocols, Life-cycle analysis of waste management techniques to determine the most appropriate conversion approach, Evaluation of the effectiveness of disposal technologies for marine debris, and Evaluation of biodegradable plastic process outcomes and the relation to the creation of micro plastics.

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