



O·S·E·A·N  
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# Marine Litter News

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Dear readers,

Concerns on marine anthropogenic litter and microplastics have been widely spread in the world. The G20 held in Bremen, Germany adopted an action plan to address the problem of marine litter. Laurent Lebreton and coauthors presented a global model showing the top 20 polluting rivers, mostly located in Asia.

When we think about the massive amounts of marine litter entering the global ocean, the efforts of Asia Pacific Civil Forum on Marine Litter (APML) could be a flash of hope for the people having concerned this issue. I am much honored to deliver this exciting news from our member countries and other contributors.

The most remarkable things in this publication are active collaboration of APML members with partners outside the region: China, USA, Vietnam, Korea, and Australia. Shanghai Rendu Ocean, China challenged the collaboration with Marine Conservation Society, UK, conducting coastal cleanups and surveys and comparing the interesting results. Green-Hub, Vietnam is conducting a project for engaging youth and stakeholders in coastal clean-up campaign for sustainable marine ecosystems in Ha Long Bay, a world natural heritage site by UNESCO with international concerns and supports. Tangaroa Blue Foundation, Australia observed a potential threat of polystyrene foam to some turtles' nesting in remote islands, highlighting the importance of regular cleanups in those areas. Ocean Conservancy, USA in collaboration with University of Michigan's Ross School of Business have worked to create sustainable business plans of 'From plastics collected during cleanups to manufacturing of products' in Hong Kong and Jamaica. Ecozine, Hong Kong invites you to the world's biggest citizen cleanup.

You can see the fascinating video game which has so much fun in spite of various tough issues threatening ocean health. It was developed in Spanish, English, and German by Catholic University of the North in Coquimbo, Chile.

Academic area also has significant achievement and developed a global project. Our Sea of East Asia Network (OSEAN), South Korea organized the first Marine Debris Conference in collaboration with Korea Institute of Ocean and Science Technology to share up-to-date researches conducted in South Korea. OSEAN also reported the first quantitative assessment of navigational threat to navy ships due to derelict fishing gears in South Korean territorial seas. CSIRO, Australia is taking on the world's largest marine pollution survey where many of APLM members are participating in.

I would like to sincerely thank all of our members' unflagging and indefatigable efforts to solve this problem. We also have been waiting for wonderful news from all over the world to inspire civil societies in the Asia Pacific region.

With love,  
June 2017,



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(Ph.D., President of OSEAN)



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\* Ms. Hyunjung Kim voluntarily assists to edit Marine Litter News, working for Greenpeace East Asia Seoul Office as a researcher.

## Free video game for children and teachers, Acuaticos

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### Acuáticos

Mass tourism, unsustainable fishing, invasive species, the exploitation of the seafloor, and the impact of litter accumulating in the seas, these are some of the main impacts to the health of our ocean today. To learn more about these impacts and possible solutions, vital to our planet, there is now a video game available for free download. Interesting facts about the species that inhabit our seas, and the calculation of your personal ecological impact on the ocean are some of the features of “Acuaticos”. The game was designed by the “Científicos de la Basura” (“Litter Scientists” [www.cientificosdelabasura.cl](http://www.cientificosdelabasura.cl)) from the Catholic University of the North in Coquimbo, Chile. With this game schoolchildren and teachers can immerse themselves in the ocean and thus learn about how we affect their ecosystems, bringing them closer to know and value the aquatic environment. “Acuáticos” is primarily a pedagogic tool, making use of today's technology to teach in an attractive and modern way. The game is made for schoolchildren between 9 and 13 years and features five minigames that address the above-mentioned man-made problems of our seas.

The video game is freely available at [www.acuaticos.org](http://www.acuaticos.org) in **Spanish, English and German**, and can also be played on a variety of platforms (computer, tablet, smartphone). You can find a short presentation of Acuáticos at <https://vimeo.com/178068533>.



Martin Thiel  
(Project lead)



Magdalena Gatta  
(Content direction and general production lead)





Opening event of "Acuaticos" held in August 2016 in Coquimbo, Chile.  
More than 200 students and teachers from different schools in the region participated



Students playing "Acuaticos" in dependencies of the Universidad Catolica del Norte in Coquimbo, Chile





Front cover of “Acuáticos”



Welcome to “Acuáticos”



Game menu of “Acuáticos”



Unsustainable fishing minigame



Invasive species minigame



Seafloor exploitation minigame

\* The video game is freely available at [www.acuaticos.org](http://www.acuaticos.org) in Spanish, English and German (<https://vimeo.com/178068533>).



### The First Korea Marine Debris Conference

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The First Korea Marine Debris Conference

The first Korea Marine Debris Conference was held at Korean Institute of Ocean Science and Technology (KIOST) in Geoje on February 16, 2017. OSEAN and KIOST have organized the conference and 80 participants across different professions attended.

The conference aimed to strengthen the network of marine debris relevant researchers and stakeholders, and share ideas of the marine debris issues with each other. Researches and related works fo-

ocusing on marine debris are increasing domestically and demands for countermeasure policies are increasing internationally. Researchers, policy advisers, staff from environmental NGO actively participated in the conference communicated and tried to make effective reduction policies on marine debris together.

The conference was composed of three sessions, which were policies and citizen activities, researches on microplastics, and industries and technology. Two to seven presentations were shared for each session.

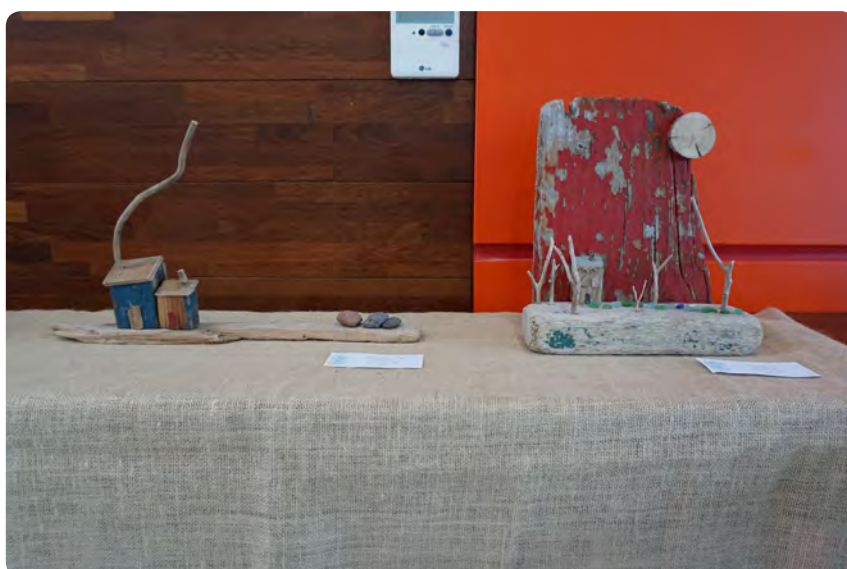
Art works relevant to marine debris were also exhibited. Jung Ah Kim, professor of Geoje College and artistic director of OSEAN, showed her drawings that had image of marine debris impacts on wildlife. She said she was shocked hearing the news that wild animals had been killed by marine debris and decided to make people better aware of the issue. Jihwan Kim presented some art works made with woods, and nails stranded to Jeju's shorelines. He shared that he has been making some useful objects such as small furnitures and ornaments using marine debris.



Dr. Won Joon Shim is presenting the recent research result on microplastics.



Displaying marine debris paintings by Jung Ah Kim, art director of OSEAN



Displaying art crafts made of drifted wood by Ji Whan Kim



## CSIRO is taking on the world's largest marine pollution survey

Dr. Denise Hardesty

Principle researcher

Oceans and Atmosphere Business Unit CSIRO Australia

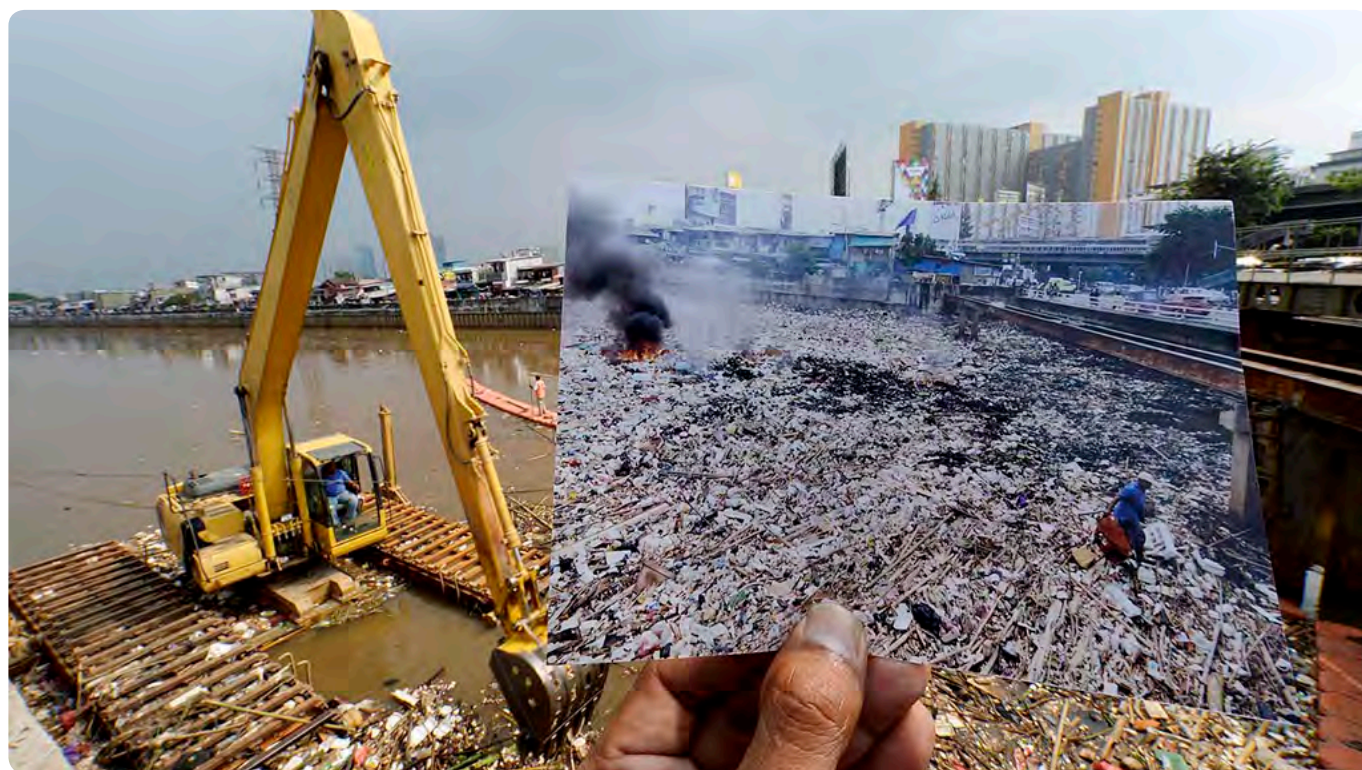
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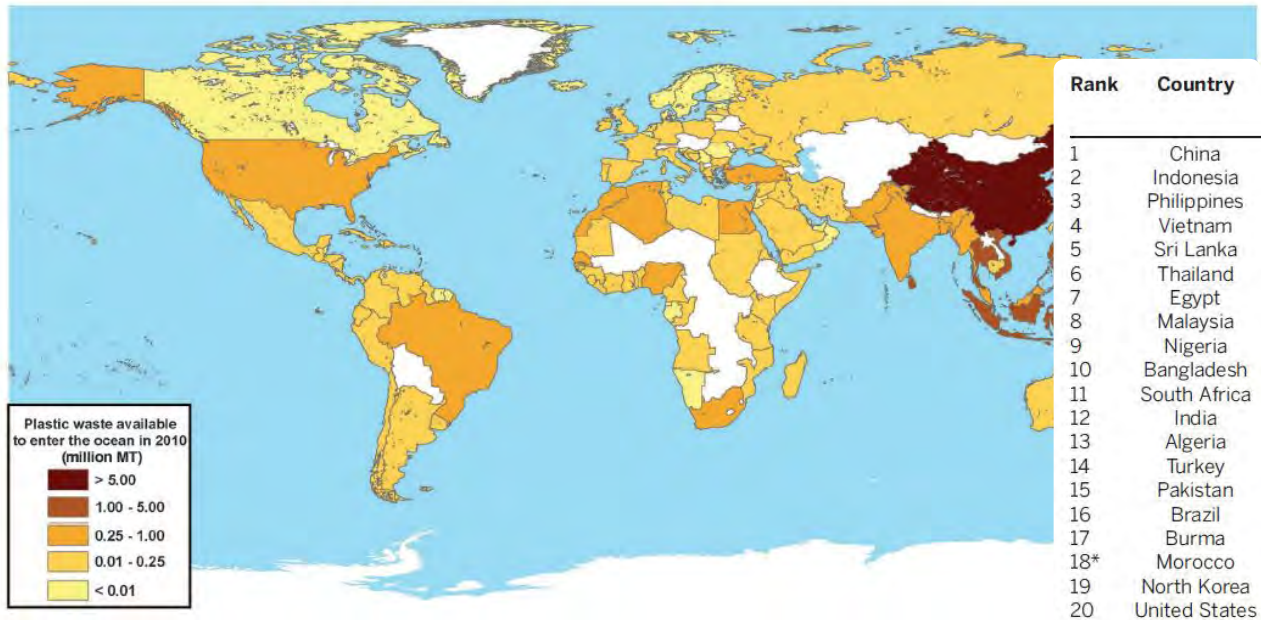
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These photos of a waterway in Indonesia show the marine pollution problem can be solved (Credit: Kompas/Wawan H Prabowo)

## Drowning in litter

It's no secret that our oceans and waterways are drowning in waste, a by-product of the world's economic growth. To date, the best estimates say there are around 6-12 million metric tonnes of plastic going into the oceans each year – that works out to be around 16 shopping bags for each metre of global coastline (excluding Antarctica).



**Fig. 1. Global map with each country shaded according to the estimated mass of mismanaged plastic waste [millions of metric tons (MT)] generated in 2010 by populations living within 50 km of the coast. We considered 192 countries. Countries not included in the study are shaded white.**

The best estimates to date of each countries impact on marine pollution (Credit: Jambeck et al. 2015)

More than 690 marine animals are reported to be impacted by this litter; seabirds and turtles are arguably two of the groups of species most heavily affected. Tube-nosed seabirds like shearwaters, petrels and albatrosses are thought to be attracted to the smell of the plastic, which once in the water and after a bit of radiation from the sun, starts to smell like their food.



Almost 50 per cent of sea birds have plastic in their guts – a number our scientists expect to climb to 95 per cent in the next 30 odd years.



Turtles also mistake plastic for food and it's believed that as many as a third of turtles have eaten plastic, mistaking it for tasty jellyfish.



Turtles are also impacted by other rubbish, especially fishing nets and other gear which in northern Australia is estimated to have entangled around 15,000 turtles. (Photo courtesy: GhostNets Australia)

It's not just wildlife that's affected. In countries where the waste and storm water infrastructure isn't advanced, rubbish (particularly single use plastic bags and other thin, film-like plastics) can choke gutters and drains, resulting in significant flooding events, damaging homes and harming local people.

### So what's being done?

Globally, there's a consensus that the issue needs immediate attention. In February, CSIRO Dr Denise Hardesty presented to the world's first G20 meeting on marine pollution. And the plastic pollution topic was the official theme for World Oceans Day 2017.

The issue was also front and centre this week at the UN's Ocean Conference in New York in June, with the international group's first target to:

*"By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution."*

### How do we tackle such a big issue?

This is where our new research comes in, as we launch the world's largest marine pollution project. Some of the world's top waste mismanagement countries (from Jambeck et al. 2015) will take part in the project including China, Bangladesh, Indonesia, Vietnam and the United States, plus other countries including Australia, South Korea, Taiwan and South Africa.

Up until now researchers and policy makers have relied on marine debris estimates based on 2010 World Bank



data. This will be the first time anyone has brought together a group of countries at such scale to collect on the ground data (literally!) to look at exactly how much waste is entering the oceans.

Leading the research, CSIRO ecologist Dr Denise Hardesty said

“This is a problem that is absolutely solvable and we’re already seeing some countries make significant improvements”.



Before and after photos of a waterway in Jakarta Credit: Kompas/Wawan H Prabowo

“By coordinating our approach we’ll be able to achieve some quick wins and know where to set our sights for longer-term goals. Our team specialises in robust and statistically designed surveys. We scrutinize how people, wind, shape of land and water move litter from land out into the ocean. We know that almost all litter started off in someone’s hand, and from there it finds its way from land to the ocean, where it breaks up into smaller pieces,” said Denise.

“By looking at how the litter makes its way into the ocean, we’ll be able to work with countries to implement interventions and solutions that are underpinned by science. We’ll make the data available to participating groups and countries, so they can report what’s happening at the local level and compare this to other countries around the world.”

Denise and her team are keen to work with as many countries as possible.

“Working with in-country organisations already doing important work will be fundamental to the project’s success” she said.

The project is a collaboration between CSIRO, the Oak Family Foundation and Schmidt Marine Technology Partners. For details or references on facts and figures, please contact [denise.hardesty@csiro.au](mailto:denise.hardesty@csiro.au).

Find out more about our marine debris research. <https://research.csiro.au/marinedebris/>

## OSEAN/CSIRO Regional plastic pollution study - training workshop report

Australia's national science agency, CSIRO, and OSEAN teamed up to run a training workshop as part of a kick-off meeting for a regional collaboration project aimed at understanding the load of plastic on land and its loss into the ocean. The new study, which started earlier this year, will document the volume of plastic emerging from countries around the world. The study will initially target the 20 countries predicted to be making the largest contribution to plastic pollution in the ocean, many of which are in the Asian region.

Partner organizations from 5 countries, including Korea (Our Sea of East Asia Network), Bangladesh (Kewkradong Bangladesh), Vietnam (Center for Supporting Green Development Green Hub), Taiwan (Society of Wilderness), and China (Shanghai Rendu Ocean) joined the team for a 3 day workshop in Korea to identify sampling regions in each country and learn the techniques that will be used to sample plastic waste in each country.



Group photo prior to the trawl sampling training

The study goal is to produce a statistically robust dataset that can be used to estimate the load of plastic flowing to the ocean and will provide a baseline to measure future improvements. The study will involve sampling plastic loads on land, in rivers, along coasts and in the ocean, to build a picture of the sources and the plume of plastic moving into the ocean. Sampling follows a robust design based on the major factors driving plastic distributions on land and at sea, tailored for each of the study sites identified by the project partners.

In addition to workshop sessions on sampling methodology and design, participants in the workshop conducted sampling in the Tongyeong City, in southern South Korea.





Training of beach survey method

These samples demonstrated the scale of the problem in coastal regions. Samples from the estuary draining Tongyeong City found plastic densities of 5,405,300 pieces per square kilometre .



Trawling using manta net with trainees



That is nearly 10 times more than the highest densities reported from the ocean gyres. The fragments found largely come from local aquaculture operations, who use polystyrene buoys in large numbers. This outcome points to the clear link between local actions and global problems, which is key point expected to emerge from the study.

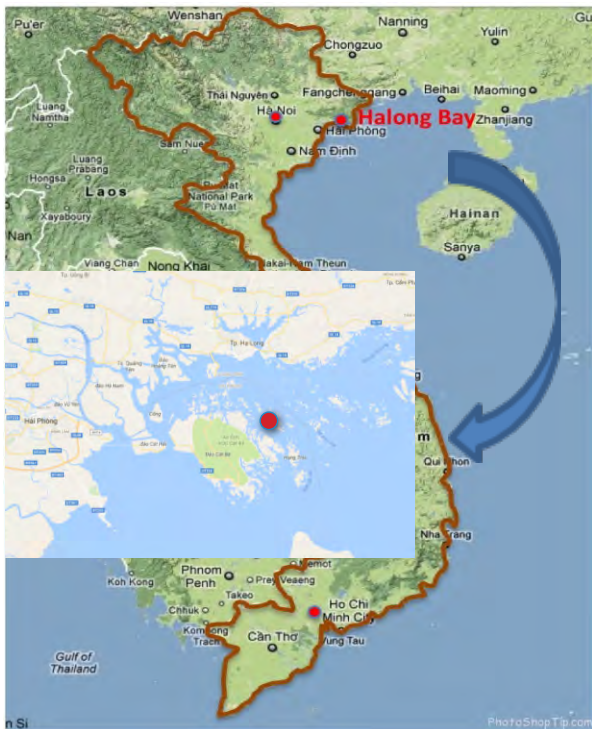
The study is based on a collaborative model, with local organizations in each of the countries leading the sampling effort, supported by CSIRO and OSEAN, who provide capacity building and coordination. CSIRO is leading the design and analysis of the study, including development of the standardized sampling methods and support to the partners in identifying sampling sites, analysing data, and producing reports for domestic and international use. OSEAN is leading the coordination across the Asian region through their network of partner organisations, and will be the lead organization for sampling in Korea. For more information on the study, to join in the network of cooperating institutions, or to learn about the methods being used contact Sunwook Hong at OSEAN ([www.osean.net](http://www.osean.net)) or Denise Hardesty at CSIRO ([denise.hardesty@csiro.au](mailto:denise.hardesty@csiro.au) or <https://csiro.research/marine.debris>).

## Addressing marine debris for a sustainable marine ecosystem in Ha Long City

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Map of Vietnam and HaLong Bay & clean-up site of Vung Ha Island (Source: <http://photoshoptip.com/ha-long-bay-photos-in-vietnam.html>)

Ha Long Bay is located in the northeastern corner of Viet Nam, 165 km from Ha Noi. Ha Long Bay covers an area of 1,553 km<sup>2</sup> with 1,969 islands, of which 90% are limestone islands. In 1962, Ha Long Bay was recognized as a vestige and beauty spot of national significances by Ministry of Culture and Information of Viet Nam and was also recognized twice as a world natural heritage site by UNESCO. The site's outstanding scenic beauty is complemented by its great biological interest. According to the scientists, Ha Long Bay boasts a high bio-diversity with the typical ecosystems of the tropical sea. The bio-diversity in Ha Long Bay is shown by the variety of species, and endemic and rare genes. According to a research conducted by the Resources and Sea Environment Institution, in 2008 at Ha Long Bay, there are 2,949 species of fauna and flora which are 1,259 inland species, 1,553 water species, 66 species of reptile and amphibian and 71 bird species. Scientists identified 102 specious and rare species at universal

and/or regional level, of which 17 plants are endemic to Ha Long Bay.

Increasing visitor numbers and associated impacts continue to impact the management of the Ha Long Bay world natural heritage. Development pressures associated with growing tourist numbers continue to be an issue for government authorities and an appropriate balance between conservation and development, while difficult to maintain, is important to ensure the protection of the natural values of the



Marine debris in Vung Ha island of Ha Long bay, June 2016  
(photo: Nguyen Trang)

property. Most Ha Long Bay marine debris originated from human actions on land, including transportation through waterways, with significant amounts coming from industry, tourism, and fishing. At high tide, coastal garbage of Ha Long Bay beach is swept away and become adrift on waters thereby floating to small islands. According to locals, the Ha Long Bay became “promiscuous” due to overcrowding of cruise ships and “disorganized” activities. In the area of Bai Chay Ward, Ha Long City, during an average day, about 450 tourist boats shuttle visitors to Ha Long Bay and nearly 1,000 cargo ships operate for international shippings.

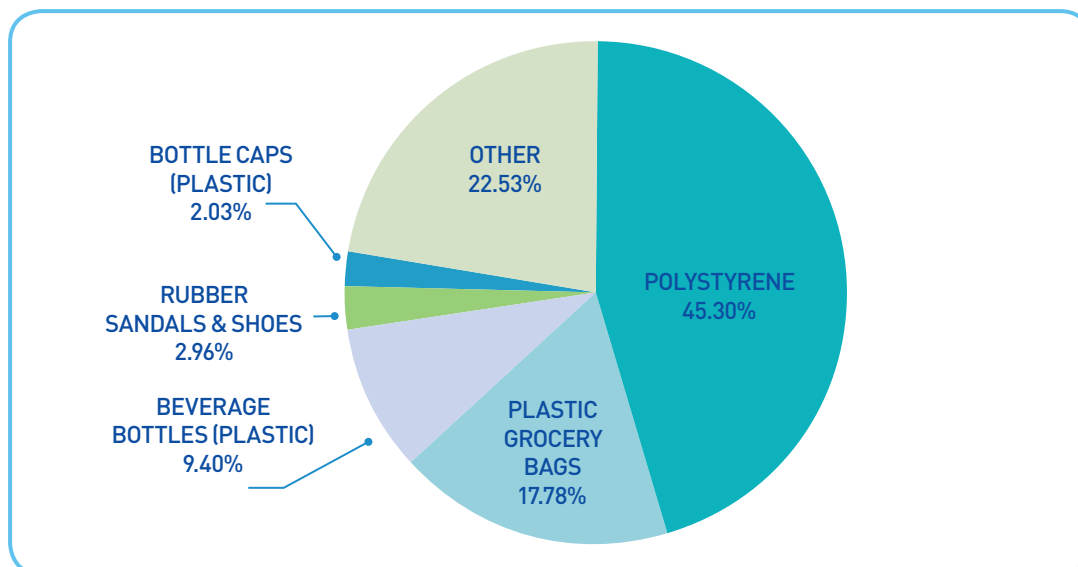
The main types of waste along the Ha Long coast and Bay include foam of polystyrene, plastic from tourism and fishing boat. Among the types of waste appearing regularly at the Ha Long bay, plastic bags and other - plastic products account for a significant amount. Plastic products need long time to decompose, and thus seriously threatens the marine ecosystem.

Recently, in 2016, ‘For Green Halong’ program was initiated by International Union for Conservation of Nature (IUCN) as part of the Ha Long – Cat Ba Alliance Initiative. The program is funded by the United States Agency for International Development (USAID) with the participation of responsible tourism companies such as Bhaya Group. The program has conducted litter collection along Halong Bay, but has lacked scientific methods to implement and collect data, or to survey and analyze the wastes.

GreenHub has cooperated with IUCN to bring the methods of collecting and analyzing data for the project of ‘Engaging youth and stakeholders in coastal clean-up campaign for sustainable marine ecosystems in Ha Long Bay’. This project has been funded by Eco-peace leadership centre (EPLC) at Kangwon National University. We, Greenhub, assisted the project by acting as technical advisors and facilitators, contributing to knowledge sharing, such as the development of education materials and a protocol for coastal clean-ups, as well as data analysis. The analysed data was provided to local managers, the Ha Long Bay Waste Management Board, and to the Ocean Conservancy for continued monitoring.

Marine debris survey and clean-up events in Ha Long Bay were co-organized on June 2016 and January 2017. Both events were successfully organized and attracted participation of a total of 220 volunteers and stakeholders from local government, distinguished guest (US Embassy in Vietnam, USAID), Ha Long Bay Management Board, and Youth Union, mass media, etc. “Join the fight for a healthy ocean” was the strong commitment of volunteers and, participants attending the two events. The source classification and proportions of the litter according to collected data cards of Ocean Conservancy during 2016 and Jan 2017 cleanup is as follows.

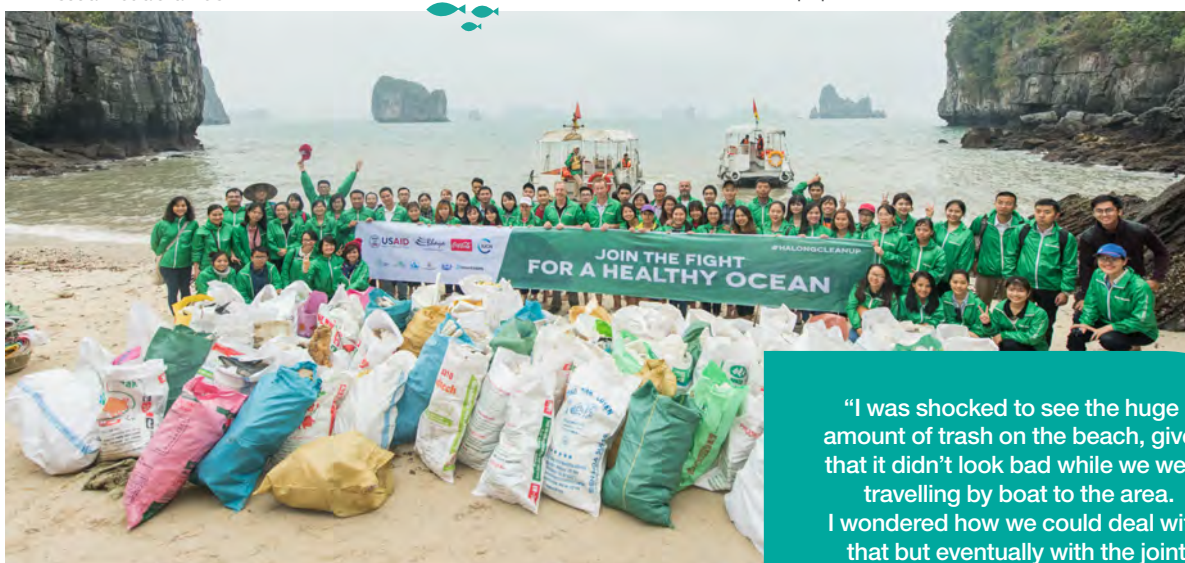




Most common marine litter items collected during coastal cleanup events in 2016-and Jan2017 (Source: GreenHub report)

The efforts of the campaigns have resulted in the Ha long Bay Peoples Committee banning the use of polystyrene and calling for the implementation of an environmentally friendly alternative. Using the momentum from the clean-up events, GreenHub has established a youth network of volunteers to promote coastal clean-ups, monitor marine debris, and to engage the community on these issues. This initiative stimulates innovations that contribute to protect Ha Long Bay's environment and positively affects the marine debris management in Vietnam.

GreenHub is calling for more support from businesses operating in and around Ha Long Bay and relevant stakeholders, volunteers to organize at least one clean-up day every three months. We appreciate volunteers who can help us fulfil this mission.



"I was shocked to see the huge amount of trash on the beach, given that it didn't look bad while we were travelling by boat to the area. I wondered how we could deal with that but eventually with the joint effort, we made it."

- Pham Thi Thay Duong, final year student at the University of Social Sciences and Humanities

## Coastal Cleanup Statistic Analysis between China and the UK

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Shanghai Rendu Ocean (SRO) and Marine Conservation Society (MCS) were responsible for the coastal clean-up activities at the 2016 International Coastal Cleanup (ICC) in China and the UK respectively. The activities were implemented and completed in September 2016 and the data of the collected beach debris have been shared between SRO and MCS.

Analysing the coastal cleanup statistics from SRO and MCS can help us understand the methods of classifying and recording coastal debris, and can reveal the amount and the composition of beach debris. The result of this analysis can lay a solid foundation for learning and cooperation between China and the UK for the purpose of dealing with marine debris.

According to the records of five coastal cleanup activities in the UK, as summarised in Table 1, four cleanups were conducted between Sep. 17<sup>th</sup> and Sep. 18<sup>th</sup> with the first cleanup implemented in June, while the fourteen ICC activities in China were implemented intensively between Sep. 17<sup>th</sup> and Sep. 27<sup>th</sup>. Two beaches, Bo'ness and Blackness, were used as the target location of ICC activities in the UK while multiple beaches in fourteen coastal cities in China were used for cleanups. As for the duration of each cleanup activity, the activity in the UK lasted for around 1-2 hours, which was similar to ours. As for the number of volunteers, it ranged from 2 persons to 40 people per cleanup activity in the UK with a relatively large variance. The number of volunteers was smaller than those in China's ICC activities.

MCS's classification of coastal cleanup debris is mainly based on the material of the trash, classifying all garbage into eight categories, namely plastic, rubber, cloth, paper, wood, metal, glass and pottery. Furthermore, debris is divided into 130 minor groups by function, including sanitary products and medical products, particles, faeces, oil, traceable items, special items and other pollutants. The coastal cleanup statistics record in China is mainly referred to the classification standard of ICC card issued from Ocean Conservancy (OC), which classifies debris

into six major categories including most-likely-to-find items, fishing gear, packaging materials, personal hygiene other trash and, less-than-2.5 cm trash. Under the six categories, debris is further divided into 56 groups with supplements of items of local concern.

In this report, the data of beach debris collected for ICC in China and the UK will be analysed according to the amount, the weight and the composition. The basic information of the coastal cleanup activities in two countries will be compared as well.

Table 1: Basic information of the coastal cleanup activities in the UK and China respectively

	Time	Location	Number of cleanup activities	Number of participants	Length of the cleaned-up beach (m)	Area of the cleaned-up beach (m <sup>2</sup> )	Total amount of the debris	Total weight of the debris (kg)
UK	2016.6.12 2016.9.17 2016.9.18	Scotland	5	66	500	3500	4546	89
China	between 2016.9.17 and 2016.9.27	12 coastal cities	14	5524	303806	/	23356	41000

Based on the MCS data from the five coastal cleanup activities in Scotland, the basic information of the cleanup actions in the two countries are summarised in Table 1. The scale of the cleanup actions in the UK is smaller than the scale in China as all the basic information indexes of the UK are smaller. This is partly related to the smaller local population, the type of beach and the intensity of human activities. This is the same reason why the condition of the collected debris varies among the twelve coastal cities in China.

In the following paragraphs, due to the different debris classification methods applied by SRO and MCS, we will analyse the conditions of the beach debris in two nations separately and then make the comparison

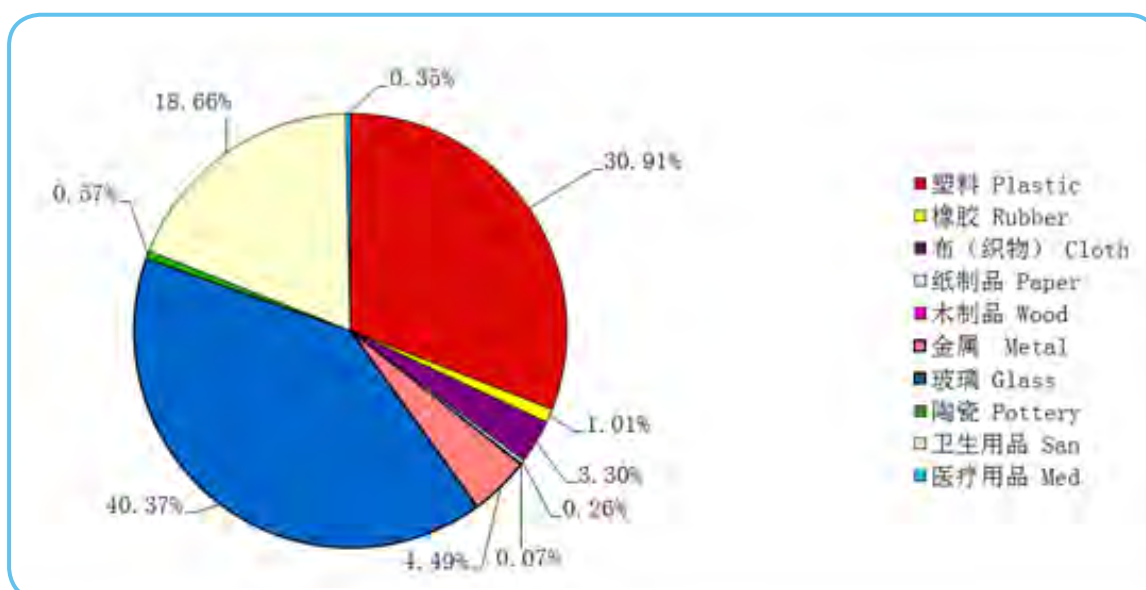


Figure 1: The composition of the beach debris in the UK  
(The percentiles are calculated using the amount of debris instead of the weight.)



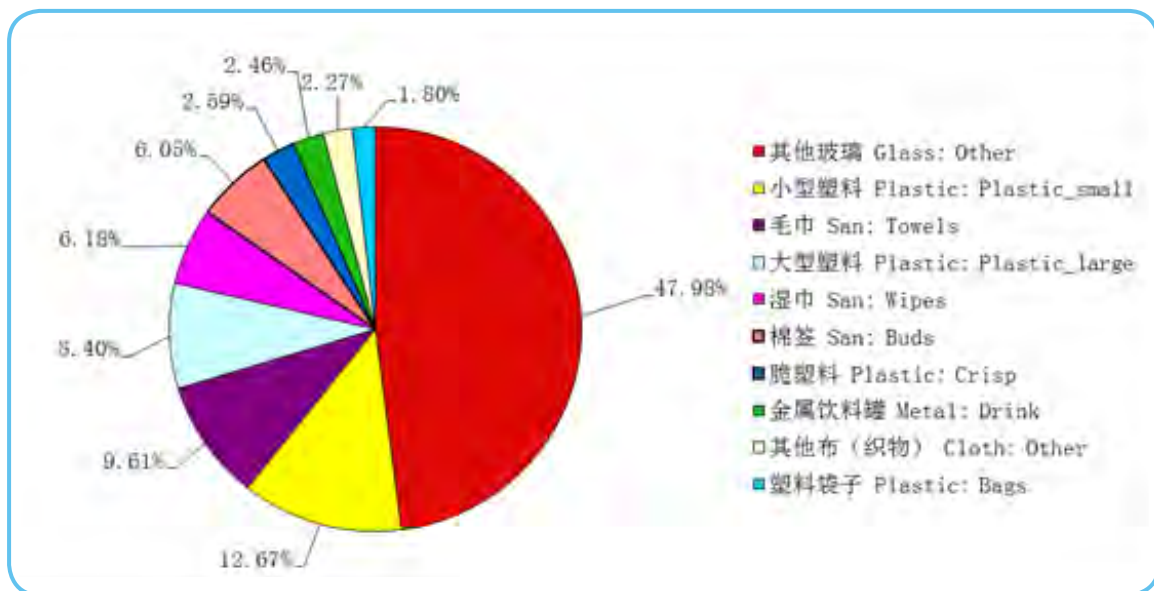


Figure 2: The top ten debris types in the UK  
(The percentiles are calculated using the amount of debris instead of the weight.)

The composition of the beach debris by major debris categories in the UK is illustrated in Figure 1 with the top ten debris types shown in Figure 2. Three features of the beach debris in the UK are described here.

### 1. Glass, plastics and hygiene kits are the majority of the debris.

Glass makes up 40.37% of all debris, including bottles, bulbs and other glass pieces in various shapes. The category of plastic debris contains up to 55 kinds, accounting for 30.91% of all debris. Hygiene kits contains 8 subclasses, including cotton swabs, towels and wet wipes, making up 18.66%. These three categories occupy 89.94% of all debris and stands for 4088 pieces of debris in total. The debris under these three categories is heavily demanded by human beings and cannot be easily degraded or well managed.

### 2. Glass pieces are the top one debris type by number.

The five beach cleanup activities implemented by MCS collected 1835 pieces of glass with irregular shapes. They are mainly generated by nearby human activities and irregular garbage dumping. It is hard to deal with glass debris because glass cannot be degraded naturally and could be easily buried. Glass debris may cause injuries to human and animals if they are not cleaned up in time. Therefore, it is necessary to cleanup the beach in time as well as to reduce the source debris by improving the garbage classification and management system to eliminate the glass debris on the beach.

### 3. There exists countless metalwork pieces on the beach.

According to the data provided by MSC, there are over 200 rusted nails (3.5cm) and over 100 staples, which means metalwork pieces should have been listed in the top ten debris (Figure 2). However, due to the lack of exact numbers, we could not calculate its percentile. Therefore, we only analyse some reasons why they exist in this report. First, most of the metalwork is tiny and it is hard to collect it without special-

ised cleaning methods. Secondly, like glass, metalwork can be easily buried and cannot be degraded naturally. They may also do harm to human beings and animals. Therefore, it is required to well manage the cleanup of metalwork and at the same time, to identify the sources of the metalwork debris in order to help preventing it's occurrence on the beach.

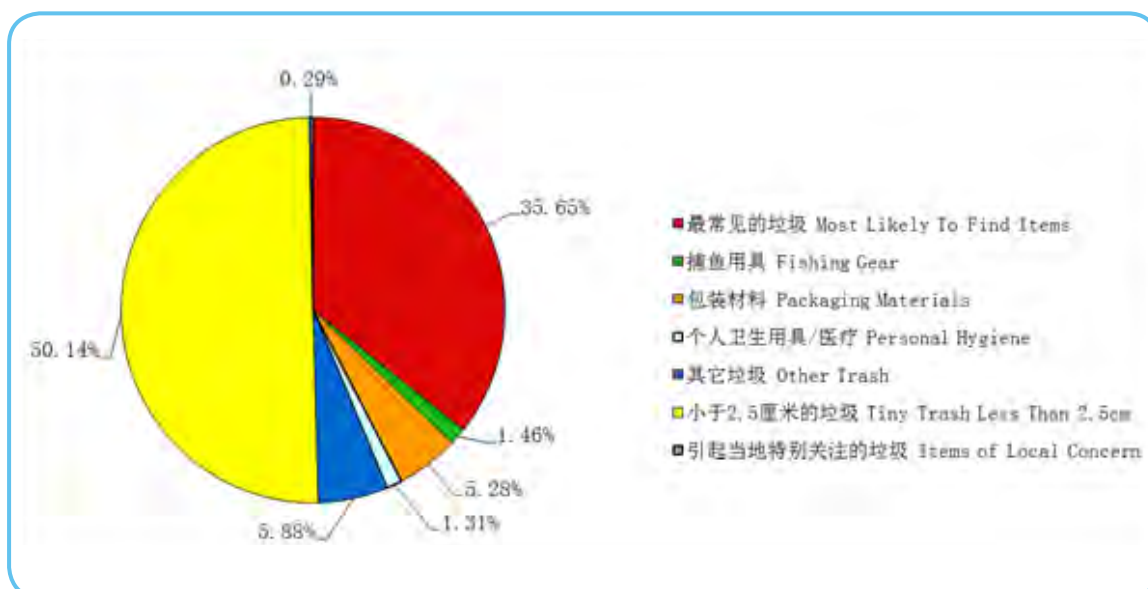


Figure 3: The composition of the beach debris in China  
(The percentiles are calculated using the amount of debris instead of the weight.)

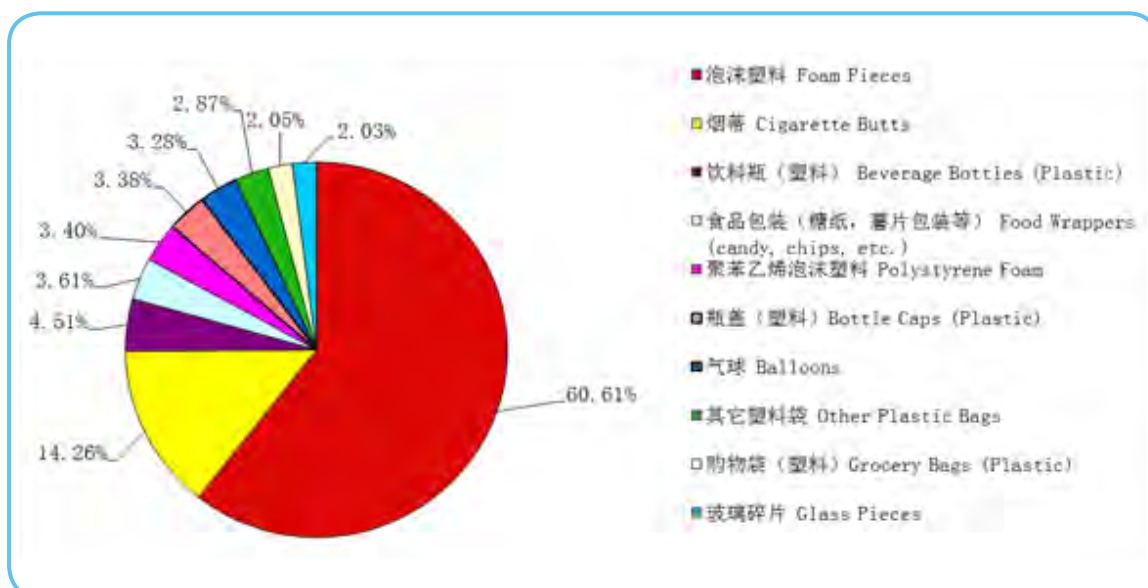


Figure 4: The top ten debris types in China  
(The percentiles are calculated using the amount of debris instead of the weight.)

The composition of the beach debris by major debris categories in China is illustrated in Figure 3 with the top ten debris types shown in Figure 4. Three features of the beach debris in China are described here.

### 1. The debris that are smaller than 2.5 cm in length accounts for the largest proportion of beach debris by number.

Debris smaller than 2.5 cm in length is composed of foamed plastics, glass pieces, plastic pieces. 11711 pieces were collected from 12 coastal cities in the ICC activity this year, accounting for 50.14% of the total collected debris. This small-sized debris can accumulate easily and cannot be cleaned up easily. Glass fragments are usually caused by human activities nearby and irregular garbage dumping. Foamed plastics and plastic fragments are mainly created from large plastic debris by natural decomposition and weathering. The dramatic amount of this small-sized debris makes it difficult to collect and account the debris. So it is critical to decrease this kind of debris from the very beginning, and to clean the beach in time.

### 2. Domestic plastic debris occupied a large amount of the beach debris.

A lot of domestic plastic debris exists within the coast embankments in China. Cigarette butts, beverage bottles (plastic), and bottle caps (plastic) are responsible for 35.65% of the total beach debris. What's more, the wrapping debris like styrofoam, plastic packages and others plastic bottles (oil, bleacher etc.) accounts for 5.28%. The domestic plastic debris are mainly polystyrene and other high-molecular polymers, which cannot be naturally degraded and can last for a very long time. The domestic plastic debris is mainly plastics and is mainly from the untreated domestic waste from cities. Another source is fishery activities and tourism. Therefore, to effectively clean the beach, multiple related institutions, such as commerce department and waste management agencies, must act collaboratively and integrally.

### 3. Styrofoam is the largest debris type by number.

During the ICC activities in China, a large number of styrofoam fragments was identified. 11053 pieces smaller than 2.5 cm in diameter were collected. Styrofoam pieces are small, fragile and mobile. Also they cannot be degraded and treated easily.

Through data analysis some similarities can be found about the two countries' beach debris.

1. Regarding the sources of debris, domestic wastes take up the vast majority of the beach garbage, both in quantity and categories. So there's a need to strengthen the domestic waste management.
2. As for the material of debris, plastic wastes account for the vast majority of the beach debris, as well as building materials, glass, clothing, wood, etc. They can cause negative impacts on coastal landscapes, ecological and biological safety.
3. Morphologically, smaller fragments are the major form of beach debris. Unlike garbage of big size large waste that can be spotted and cleaned up easily, they are distributed widely, easily accumulated, and cannot be identified easily. Therefore, the fragment type debris is one of the biggest difficulties facing



beach debris management, which must be controlled from the source.

At the same time, there are differences between the beach debris data from both countries.

1. As MCS has only provided limited data from their activities, on average, for each activity the number of volunteers, cleaned-up coastline length, garbage quantity and weight in China were all larger than those in the UK, reflecting the fact that the beach debris issue is more serious here.

2. As for classification standards, MSC's method is mainly based on the material and the production purpose of the wastes, so as to easily analyse how beach debris is formed, and the main source. The debris classification standard used by SRO is according to the frequency of garbage appearance, source of garbage and its shape and size. Thus, SRO's system is more comprehensive in terms of identifying and recording collected debris. Plus, data analysis process of small- and medium-sized garbage has a higher standard.

3. In the UK, the fragments are mainly glass and metal with the most being irregular pieces of glass and rusty nails, staples which cannot be cleaned easily and may damage organisms. While in China the small-sized fragments is mainly made from plastic foam trapped in the sea along the dam and the bottom of the plants. It can barely degrade and thus often get collected. Moreover, it will cause environmental pollution to the landscape, even threatening the life of the birds that eat garbage by mistaking it for prey.

To sum up, marine debris has become a global issue, for which the research methods are becoming professional, scientific, and systematic. I hope that the two countries can further deepen cooperation on this issue, communicate with and learn from each other in all aspects including research methods and governance tools, and increase information exchange so that the seas will be protected and restored to cleanliness.

## Plastic waste crisis at Australian islands in Indian Ocean

Carmen Riordan

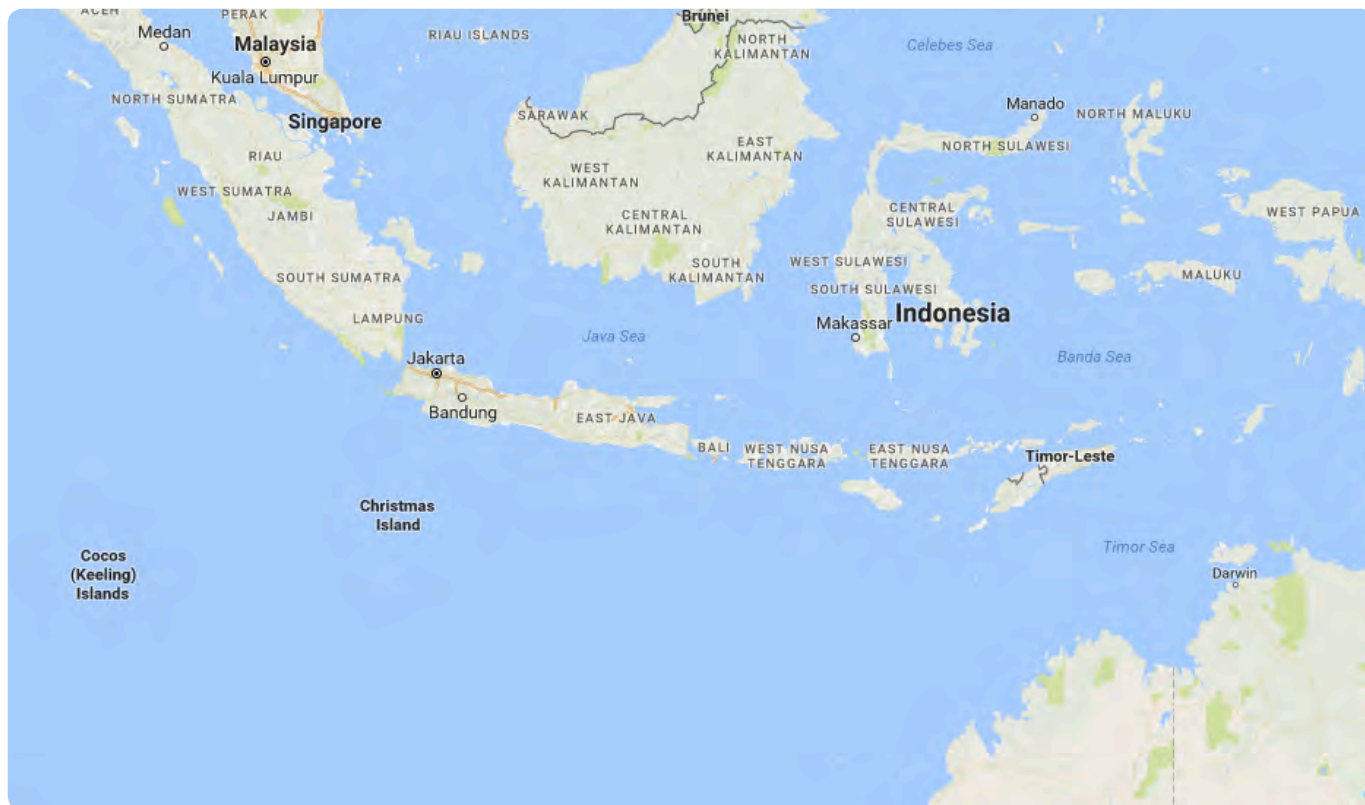
Tangaroa Blue Foundation

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Tangaroa Blue Foundation is an Australian organisation dedicated to the removal and prevention of marine debris. The Foundation created the Australian Marine Debris Initiative (AMDII), which is a network of volunteers, communities and organisations across Australia that conduct local beach and river clean-up events and contribute data about rubbish collected to the AMDI Database. The AMDI helps communities look after their coastal environment by providing resources and support programs. More than 80 000 volunteers clean up 2200 coastal and river locations around Australia, including islands.

The Foundation also works on solutions to stop the flow of litter at the source. It collaborates with industry and government to create change on a large scale to staunch the flow of litter into the marine environment.

In March 2017 Tangaroa Blue Foundation volunteers partnered with the Keep Australia Beautiful Council and the Department of Environment Regulation WA as well as local communities including school students at two Australian Territories in the Indian Ocean, the Cocos Keeling Islands and Christmas Island. Together they conducted beach clean-ups and collected data at these remote islands. While both Australian Territories are located in the Indian Ocean, the two are quite different topographically. Christmas Island is the flat summit of an underwater volcanic mountain that rises high above sea level, to more than 300 metres. On some sides land and ocean meet dramatically as rocky cliffs. The Cocos Keeling Islands by contrast consist of low sandy atolls and coral islands. While there were many similarities in the kind of debris collected at each site, there were also some significant differences.



Map shows remoteness of Cocos Keeling Islands and Christmas Island (Source: Google Maps)

## Cocos Keeling Islands

At six sites at the Cocos Keeling islands a small army of 207 people scoured 3640 m of beach and collected 2038 kg of debris, consisting of 50 326 individual items, which filled 254 bags (see Table 1).

### 2017 Cocos Keeling Islands Marine Debris Project – Top 9 Items

Item	Total
Plastic hard remnant pieces	12034
Plastic lids and bottle tops	4323
Thongs	3729
Rubber remnant pieces	3676
Foam packaging	3529
Plastic food packaging	3243
Plastic drink bottles	2999
Plastic personal care bottles	1706
Cigarette lighters	1472



[www.tangaroablue.org](http://www.tangaroablue.org)

The nine most numerous debris items collected at the Cocos Keeling Islands



Plastic debris travels around the world via ocean currents. Most of the plastic debris collected at these islands arrives via currents from Asia. It is relatively easy to identify the source of plastic water bottles if the label is still legible. Of the 2999 drink bottles collected, the source of around half could be identified, and the vast majority of these originated from Asian or other foreign sources (see Table 2).

2017 Cocos Keeling Islands Marine Debris Project – Foreign Items	
Plastic drink bottles	Totals
Total	2999
Unknown	1525
Australian	75
Foreign	1054
Aqua – Indo	410
Nongful Springs – China	86



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Sources of plastic drinking bottles collected at the Cocos Keeling Islands

## Christmas Island

At Christmas Island more than 220 kg of rubbish was collected from just 55 m of beach, including 488 thongs and 2920 pieces of polystyrene foam.

There are many similarities between sources of debris collected at the Cocos Keeling Islands and that collected at Christmas Island, as is evident when sources of plastic water bottles are compared (see Table 3). With a total of 1835 collected, half of the sources can be identified with almost all of these also being from Asian or other foreign sources.

Plastic drink bottles – Christmas Island	
Plastic drink bottles	Totals
Total	1835
Unknown	916
Australian	10
Foreign	909
Aqua – Indo	172
Nongful Springs – China	66



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Sources of drink bottles at Christmas Island

There were, however, some notable differences in the type of debris collected at Christmas Island, with polystyrene foam being a far more significant problem. Plastic pieces were also a problem, and unfortunately these keep breaking up into smaller and smaller pieces, making them more difficult and time-consuming to collect with time and weather exposure.

Christmas Island is a significant turtle nesting site and the potentially devastating impact of polystyrene was made clear when a partner described what they observed one night at Greta Beach, a critical turtle nesting site. Sadly, after hearing turtles' flippers scraping against polystyrene foam and plastic, some turtles were observed to give up trying to dig nests because they couldn't get through the layers of debris.

This highlights the importance of regular ongoing clean-ups at turtle nesting sites to assist in successful nest digging and breeding. Fortunately students in years 9 and 10 on Christmas Island have committed to fully clean up Greta Beach on 19 May for Sea Week. This will be documented and publicised and will happen on an ongoing basis.

While our wonderful volunteers do a fantastic job in beach clean-ups, this is only part of the solution. The plastics that have already ended up on beaches are just a small fraction of what floats in the ocean and is yet to arrive. The deadly impact on marine life such as seabirds and turtles is well known. As our plastic consumption is ever-increasing it is vital to address the problem of marine plastics at the source. Prevention is better than cure.

## References

Google Maps

Sky News

[www.tangaroablue.org/amdi/amdi-program/wa/742-ocean-rescue-sky-news.html](http://www.tangaroablue.org/amdi/amdi-program/wa/742-ocean-rescue-sky-news.html)

Tangaroa Blue website

[www.tangaroablue.org](http://www.tangaroablue.org)

Report on Christmas Island clean-up

[www.tangaroablue.org/amdi/amdi-program/wa/740-christmas-island-adventure.html](http://www.tangaroablue.org/amdi/amdi-program/wa/740-christmas-island-adventure.html)

Report on Cocos Keeling Islands clean-up

[www.tangaroablue.org/amdi/amdi-program/wa/734-inaugural-cocos-island-marine-debris-project.html](http://www.tangaroablue.org/amdi/amdi-program/wa/734-inaugural-cocos-island-marine-debris-project.html)

## Exploring a Closed Loop Cleanup

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Research Team at Lap Sap Wan, Hong Kong



A persistent obstacle confronting beach and waterway cleanups around the world is finding alternative disposal options that would provide plastics and other forms of debris a secondary life. Currently, collected debris is most often disposed of into landfills or converted into energy and most recyclers claim the degree of fouling or degradation of debris, specifically plastics, renders them unsuitable for recycling. In all instances, valuable resources are lost into a finite disposal pathway. As more and more plastics are removed through the International Coastal Cleanup (ICC) and other cleanup efforts throughout the year, identifying alternative disposal options to divert materials from landfill is critical. Marine plastics can present challenges to local recyclers due to varying quality levels; however, they have the potential to be transformed into useful products by enterprising companies, extending their lifecycle, reducing the use of virgin plastics, further enhancing marine debris awareness and serving as a unique brand differentiator for companies in a crowded market.

During the past six months, Ocean Conservancy worked with a six person team of graduate students from University of Michigan's Ross School of Business (Michigan Team) to create sustainable business plans that could supply ocean plastics collected during cleanups as an input into the manufacturing of products. The Team's specific charge was to build a roadmap to best utilize plastic waste collected during ICC efforts to raise awareness of the importance of reducing marine debris and to materially reduce the amount of plastic waste leaking into the ocean. Additionally, how could profits be best invested into supporting local volunteer cleanups and/or mechanical interventions like river debris booms or trash traps to stop plastic waste before it enters the marine environment?

The Michigan Team spent two weeks of intensive fieldwork in Hong Kong and Jamaica, where they were privileged to work with National ICC Coordinators, Ecozine and Jamaica Environment Trust (JET), respectively. The field work components of the project provide the Michigan Team an unparalleled look at the conditions and characteristics of plastics debris on beaches and in waterways, and more importantly offered a firsthand perspective on the challenges and opportunities associated with beach cleanups and plastics collection. In both countries, the Michigan Team met with local partners, waste haulers, and government officials—all of whom provided critical insights to inform some part of the newly forming ocean plastics supply chain.

The Michigan Team delivered their findings and recommendations to Ocean Conservancy in May, which we will use to inform discussions with our global ICC partners on the potential to implement pilot projects during the 2017 ICC. We are optimistic about the potential for an ocean plastics supply chain to create even greater awareness about the problem of ocean plastics. Working with our global partners, we will ensure that any proposed ocean plastics supply chain is both environmentally and economically sustainable, and more importantly that it delivers an increased conservation benefit to the ocean.

## Let's Keep Hong Kong Clean Join the world's biggest citizen cleanup!

Three ways to participate in the Hong Kong Cleanup Challenge

Julia Whitney

Event Manager

ECOZINE | HK Cleanup | Refined Travellers

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**ECOZINE**



Ocean Conservancy

THE HONG KONG CLEANUP CHALLENGE IS THE OFFICIAL PARTNER FOR  
OCEAN CONSERVANCY'S INTERNATIONAL COASTAL CLEANUP  
**REGISTER A TEAM AT [WWW.HKCLEANUP.ORG/REGISTER](http://WWW.HKCLEANUP.ORG/REGISTER)**

The 17th Annual Great Hong Kong Cleanup Challenge is ON NOW through 1 December.

Anyone can participate, whether you have five minutes, one hour, or a whole day.

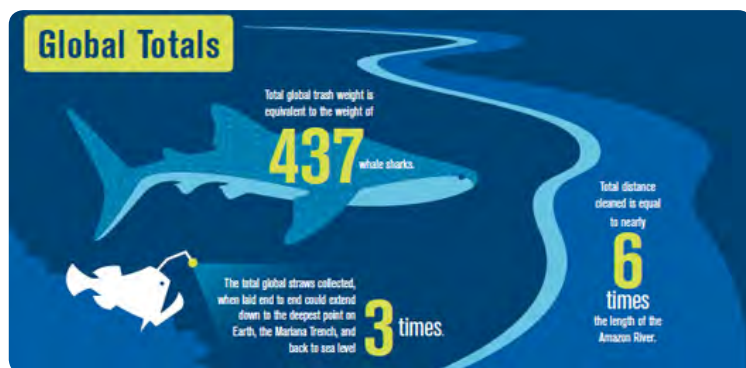
More than 8,000,000 tonnes of plastic is currently entering the oceans, every year.

It is predicted by scientists that by 2050, there may be more plastic in the ocean than fish.

## Why not do something about it, and have fun while you're at it!

The 17th Annual [Hong Kong Cleanup Challenge](#) is **ON NOW** through 1 December 2017- and there's never been a better time to get involved! Since 2000, Hong Kong Cleanup has mobilised almost half a million people in more than 25,000 groups to collect over 100,000,000 tonnes of trash. In many cases, these community clean-ups have been just the start - inspiring people to make real and lasting changes in their neighborhoods and to come together to work on other initiatives to improve their local environment.

But this is just the beginning. We want everyone to show they 'Love Where They Live' by getting out on to Hong Kong's coasts, trails, streets and public spaces.



This year, we are calling on ALL Hong Kong individuals, family's, volunteer groups, local councils, businesses and schools to do their bit. We are focused on the ambitious goal of cleaning up Hong Kong from waste in one massive effort.

If we succeed, we'll engage 5% of Hong Kong's population. This isn't just a number we've pulled out of a hat. This number represents the estimated amount of people necessary to create lasting change and go beyond just one day of incredible activism.

Do you think you'd like to be the person that helps unites your entire country for a massive cleanup action?

The year-long Hong Kong Cleanup Challenge brings together the ocean community, and stakeholders (business, government, academia, international organizations and NGOs) for a practical, and solutions based environmental event.

The programme has been developed in close consultation with our charity partner, Ocean Conservancy. The global event, for which we are the official Hong Kong coordinator, is being recognized as the world's most ex-



pansive global environmental volunteer undertaking, with around a million participants each year.

Data collected from Hong Kong Cleanup is used to compile the Global Trash Index, and Trash Free Seas Alliance – providing an international snapshot of what’s trashing our ocean so work can be done to prevent specific items from reaching the water.

There are **THREE** ways to participate:

### 1. SPONSOR THE GREAT HONG KONG CLEANUP CHALLENGE

Aligning with The Hong Kong Cleanup provides a way to contribute to a cleaner, healthier environment.

Furthermore, the company brand would benefit from a partnership in many ways, some of which include:

- Creating **positive alliance** with a highly visible and worthy cause
- Positions company as an **employer of choice** in Hong Kong
- **Extensive marketing** across all Hong Kong Cleanup outreach efforts for the entire year
- Increasing “**brand loyalty**” from Hong Kong Cleanup volunteers who appreciate your support
- Engaging your employees in a fun, inclusive, and family-friendly event that helps “**build morale and pride**”
- “**Managed Cleanups are included!**”
- ...and many more!

### 2. HIRE US TO ORGANIZE AND MANAGE A CLEANUP EVENT FOR YOUR STAFF

If you have not experienced a cleanup before or would like to get more out of it for your staff or group, our team organises and manages tailored, bespoke Cleanup Events on request. Management fees are based on group size among other factors.

Under this participation option our team will:

- Complete all paperwork for enrollment in The Challenge
- Advise on coastal/country/city options and coordinate your trip
- Provide you with support for inviting and engaging participants
- Assign experienced staff to manage your group
- Plan and lead event-day education briefing and cleanup exercises, including competitions and optional icebreakers
- Provide all cleanup and data materials
- Present an onsite Award Ceremony for participants, with prizes included
- Support data collection and submission on your behalf
- Your company will be included in the annual report

### 3. SIGN UP A TEAM FOR THE CHALLENGE

Get a team together, pick a date and location, and REGISTER!

- Team registration and participation in the 2017 Cleanup Challenge
- Opportunity to win gold, silver or bronze awards in the Challenge and be recognized at the 2017 Awards Ceremony
- Team Captain invitation to the 2017 Awards Ceremony event

- Guides, Tips and Data Materials for your cleanup
- Attendance at a monthly 'how-to' cleanup seminar
- Limited edition Hong Kong Cleanup t-shirt from Tsunami Sportswear
- A Hong Kong Cleanup reusable water bottle for your use
- "10 Ways To Reduce Marine Litter" infographic poster
- Charity discount on custom team t-shirts and other partner merchandise
- Access to campaign materials to promote your efforts
- Team name acknowledged in the official 2017 Hong Kong Cleanup Report and website
- ...and more!



#### GOT QUESTIONS?

E-mail us; we're happy to help!

Please like and follow us on Facebook, Instagram and Twitter to stay in the loop on cleanup happenings and updates!

Thank you for all that you do for our oceans,  
Lisa Christensen, and The Hong Kong Cleanup Team

PS - Remember to REGISTER SOON, as cleanup sites are first-come, first-served!

## Navigational threat to naval ships by derelict fishing gear in South Korea

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A study proving that derelict fishing gears (DFG) such as fishing nets and fishing ropes cause extensive navigational troubles by being wound on propellers of powered vessels was published in the international journal. The study is based on the information that Sea Salvage & Rescue Unit (SSU) in Korea has recorded during maintenance of vessels from 2010 to 2015. Of all Korean navy vessels, a total of 397 cases per year were reported as being results of catching DFG. Each vessel had experience of being fixed more than once in a year because of DFG. The annual number of cases has decreased a little but the weights of DFG have increased.

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### Navigational threats by derelict fishing gear to navy ships in the Korean seas

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#### ARTICLE INFO

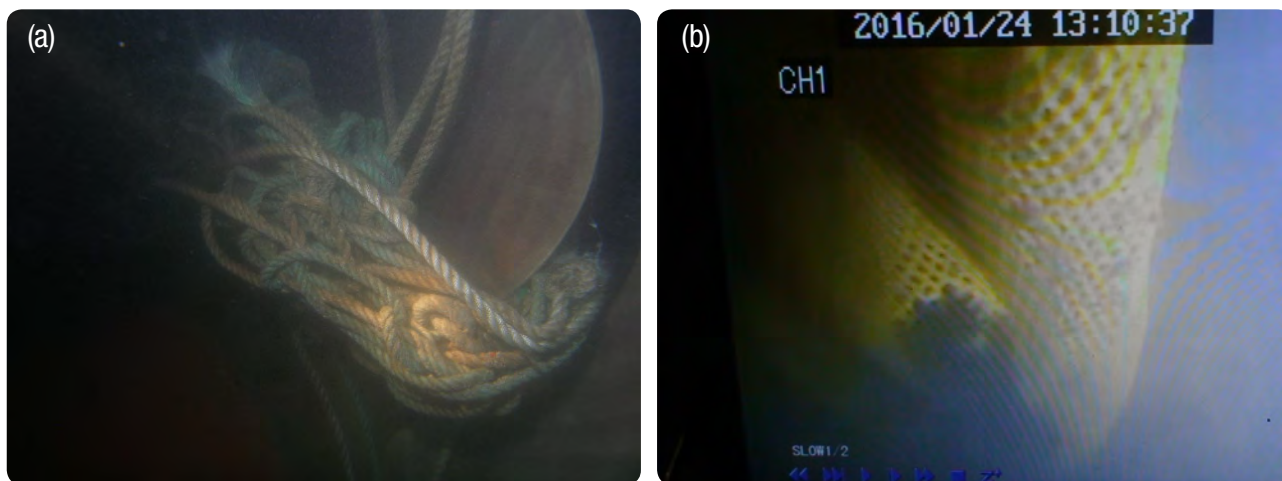
##### Keywords:

Marine debris  
Derelict fishing gear  
Navigation  
Propeller entanglement  
Impact  
Korea

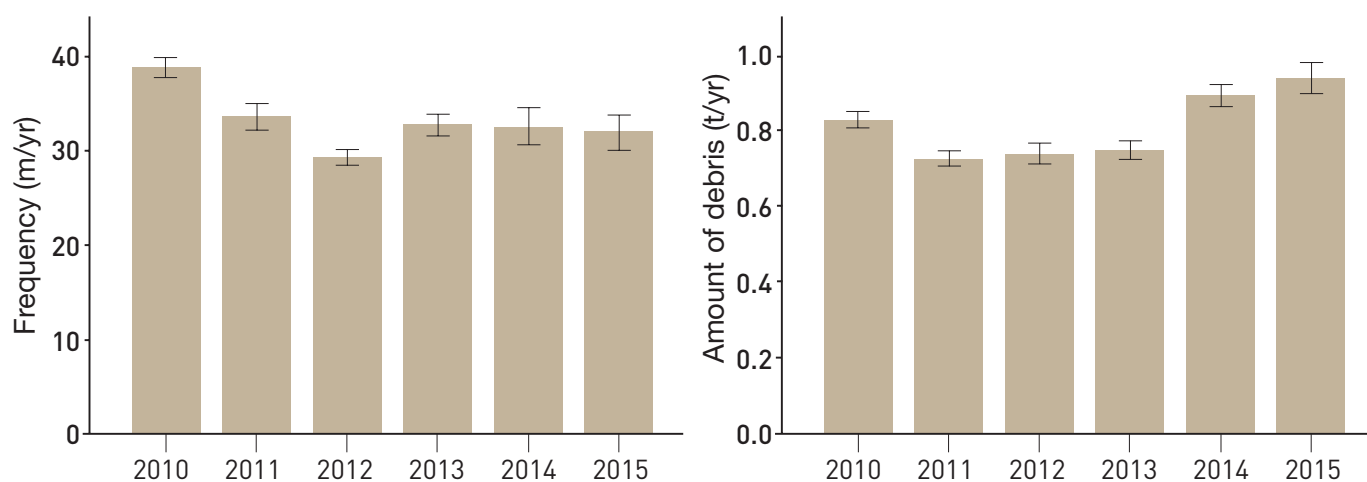
#### ABSTRACT

This study assessed the impact of derelict fishing gear (DFG) on navigation. The Republic of Korea's navy (ROKN) recorded every case of approximately 170 naval ships associated with propeller entanglement by DFG from January 2010 to December 2015. The frequency of cases was 2.3 per ship and 397.7 ( $\pm 37.5$ ) per year. The amount of DFG disentangled was 0.025 tons per ship and 10.0 ( $\pm 1.7$ ) tons per year. The frequency temporally decreased whereas the amount increased over these six years. To disentangle propellers, 3.1 divers were needed on average per case. Propeller entanglement occurred in all local seas and some of these areas showed increases over time. Our study highlights that the impact of DFG on navigational threats has been persistent and ubiquitous and can potentially be reduced by preventing DFG in fishing areas, with a focus on improved management by fishermen and government and with more efficient retrieval of DFG.





Examples of ROKN ship propellers entangled by fishing ropes (a), fishing nets (b) (Photo: ROKN SSU).

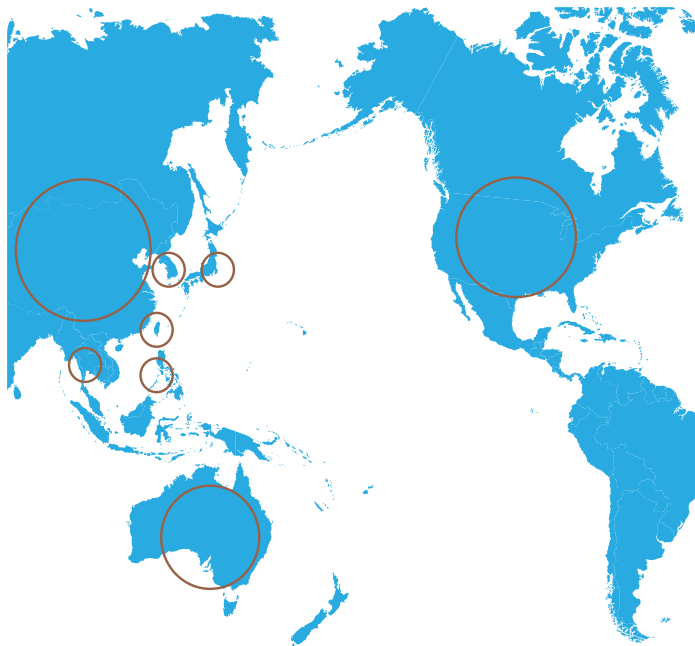


Frequency of cases of ROKN ships entangled and amount of DFG removed from propellers over six years.

The main author Dr. Sunwook Hong said, “It is the first report that quantitatively analyzed damages caused by DFG on the vessel. We should investigate the impact of DFG on the entire Korean vessels and reinforce policies to stop them from entering into the ocean”.

The study estimated economic losses from derelict fishing gear as amounting to 62 million dollars. It calculated only labor charges for divers, and so if this estimate were to include expenses for transport of vessels to the fixing area and fuels and labor charges for the crew, the losses would be much higher. It is also necessary that other vessels be checked for the damage by DFG.

The study is the outcome of a joint research by OSEAN and the Republic of Korea Navy Academy. The paper published on the Marine Pollution Bulletin which is one of the SCI journals. The authors give special thanks to Republic of Korea Navy, Sea Salvage & Rescue Unit to Sea Salvage & Rescue Unit for giving its valuable records of 6 years.



### What is Asia Pacific Civil Forum on Marine Litter?

Asia Pacific Civil Forum on Marine Litter is a network established in 2009, made of NGO groups dedicated to protection of marine environment from marine litter in Asia Pacific countries.

#### Network member groups are:

Japan Environmental Action Network (JEAN)  
Our Sea of East Asia Network (OSEAN)  
Taiwan Ocean Cleanup Alliance (TOCA)  
Shanghai Rendu Ocean NPO Development Center  
Kewkradong Bangladesh  
ICC Philippines  
Tangaroa Blue Foundation  
Ocean Conservancy

### To the readers,

East Asian countries are connected to each other environmentally, geographically, historically, or culturally through shared regional seas. The East Asian region is one of the most dynamic economic centers with some of the busiest shipping lanes in the world. With the spread of mass production and consumption over the last decades came the huge increase in solid waste generation. There are, however, not enough waste treatment facilities and management measures, which makes the region vulnerable to marine debris pollution.

Entering the seas in large amounts, floating debris has become a source of concerns and conflicts among some neighboring countries. This transboundary environmental problem requires concerted efforts of all the relevant stakeholders beyond sectoral and political boundaries. In this regard, OSEAN (Our Sea of East Asia Network) and JEAN (Japan Environmental Action Network), the marine debris NGOs in Korea and Japan, have shared a vision in which people in the East Asia could act together as one community in protecting our precious marine ecosystems. We believe that NGOs in the East Asian countries have an important role in sharing experiences and acting together to address the marine debris issue in the region from the bottom up.

The city governments of Shimonoseki and Nagato, and JEAN co-organized '2009 Marine Litter Sum-

mit - Shimonoseki•Nagato Meeting' on October 16-18, 2009, in Shimonoseki, Japan. OSEAN suggested in the meeting to start an 'East Asian Civil Forum on Marine Litter' through which relevant NGOs and organizations in the East Asia could share experiences and information and work together on the marine debris problems. OSEAN and JEAN have reached a consensus to launch the forum and publish biannual newsletters. So we have launched the East Asian Civil Forum on Marine Litter and we are delivering marine debris news from member countries via e-mail to people who are concerned with this problem on local, national, and regional levels. In late 2012 now, we have four members above. We hope that the forum could provide a venue for all of us to share our vision, experiences, and creative actions.

This is the first effort to link the East Asian people beyond geographical and language barriers to a common goal of protecting our seas from marine debris pollution. NGOs and organizations that have interests and passion to make our seas clean and healthy are more than welcome to join us. For more information, you can contact us at [loveseakorea@empas.com](mailto:loveseakorea@empas.com). Please let us know if you have any problem in receiving the newsletter. These articles are also available online at <http://cafe.naver.com/osean>.

Secretariat,  
Sunwook Hong (OSEAN) and Kojima Azusa (JEAN)

## Asia Pacific Civil Forum on Marine Litter



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