Project: Promotion of countermeasures against marine plastic litter in Southeast Asia and India

Activity Report:
Chiang Rai Province, Thailand

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1. Background

The United Nations Environment Programme (UN Environment) has formulated a new initiative, “Promotion of countermeasures against marine plastic litter in Southeast Asia and India”. The project is funded by the Government of Japan. It aims to boost information and know-how to develop countermeasures against marine plastic litter in Southeast Asia and in India.

Marine plastic litter has become a very prominent environmental problem in recent years . About 80% of plastic waste entering the ocean comes from land-based sources. Without intervention, at least 17 million metric tons of plastic is expected to enter the world's ocean every year by 2025. Plastic leakage into the environment in Asia is mainly due to an exponential growth in plastic production and consumption as well as weak waste management. Open dumping is still the prevalent disposal option in the region. The formal waste collection system has limited coverage in the region. To reduce marine plastic litter, it is necessary to reduce plastic waste and microplastics flowing to the ocean through the major rivers such as the Ganges River and the Mekong River.

This activity is part of the efforts to develop a simulation model for plastic leakage and monitor to determine leakage hotspots along the Mekong and the Ganges. Given its complicated nature of plastic leakage scenario, plastic leakage scenario development requires a wide range of data, such as socio-economic data, waste management information, hydrological data, and infrastructure data. Mae Fah Luang University (MFU) is leading the field research in Chiang Rai to develop a fine-scaled plastic leakage scenario.

2. Scope of Work

The scope of this work covers the collection of data to develop a fine-scaled plastic leakage scenario in the Mekong River system. It consists of two key activities:

2.1 Collection of secondary data. This includes desktop research and interviews with stakeholders to collect necessary data for plastic leakage analysis in Chiang Rai. UNEP designs the data inventory regarding demographic information, topographic/basin characteristics information, land use, infrastructure, and waste management information. The Geoinformatics Center (GIC) at Asian Institute of Technology coordinates the data collection to be incorporated into the GIS platform

2.2 Collection of primary data. This includes the sample collection of macroplastics in the Mekong River and physical inspection of local hotspots that can pollute the waterways in Chiang Rai and subsequently the Mekong River. The site selection and data collection are planned with local authorities and in consultation with stakeholders and UNEP. The physical inspection is performed using the web application developed by GIC.

This report presents the results of these activities. Section 3 describes key characteristics of waste management in Chiang Rai. GIS data are shared with GIC as supplementary materials: https://drive.google.com/open?id=1m0C6bE-bhVjRIW81oss9brOS3CauyIFI. Similarly, Section 4

focuses on the sample collection of macroplastics as the data from the physical inspection are submitted through the application. The data collection plan can be found in Appendix A.

3. Waste Management in Chiang Rai

Table 1 reports basic demographic and administrative data of Chiang Rai, Thailand. With the total land area of 11,678 km^2, it has a population of 1.3 million. The province is divided into 18 districts (Amphoes), 124 sub-districts (Tambons) and 2,481 villages (Moo Bans) and communities (Chumchons). Chiang Rai has 144 local governments with elected mayors. 143 local governments are at a sub-district level. The most urbanized area in the Muang District is the responsibility of Chiang Rai Nakhon Municipality. Others are either a tambon municipality or a tambon administrative organization (TAO). Chiang Rai Provincial Administrative Organization (CR PAO) is responsible for the coordination between other local governments.

Table 1. Demographic and administrative data of Chiang Rai Province.

District	Local Governments	Population	Households	Villages & Communities
Khun Tan	4	31,840	11,201	63
Chiang Khong	8	63,298	26,046	137
Chiang Saen	7	54,180	21,722	92
Doi Luang	3	19,165	8,386	33
Thoeng	12	85,875	28,771	176
Pa Daet	5	26,214	8,154	58
Phaya Mengrai	6	42,048	14,373	118
Phan	16	121,846	43,830	297
Muang Chiang Rai	16	272,696	111,111	460
Mae Chan	13	105,354	39,566	171
Mae Fah Luang	4	72,768	21,282	116
Mae Lao	7	31,355	11,656	84
Mae Suai	9	87,009	28,335	214
Mae Sai	10	111,734	49,467	137
Wiang Kaen	4	34,979	11,829	43
Wiang Chai	6	44,660	17,130	107
Wiang Chiang Rung	4	27,690	9,230	60
Wiang Pa Pao	9	68,863	25,940	115
Total	143	1,301,574	488,029	2,481

Source: Department of Local Administration.

Table 2 reports the key economic activities that can be local hotspots of plastic consumption and waste generation in Chiang Rai Province. There are 918 factories, the majority of which are located in Muang and Mae Chan Districts. Tourism is another important industry and Chiang Rai

has hundreds of tourist attractions, service points, and accomodations. Outside downtown, tourists' activities are concentrated in Mae Sai, Chiang Saen and Chiang Khong, all of which borders either Myanmar, Lao PDR or both.

Table 3. Local hotspots of key economic activities in Chiang Rai Province.

District	Factory	Tourist Attraction	Tourist Services	Hotels Resorts
Khun Tan	19	2	2	1
Chiang Khong	35	4	5	23
Chiang Saen	42	15	19	31
Doi Luang	6	0	0	0
Thoeng	45	6	10	15
Pa Daet	23	1	1	1
Phaya Mengrai	6	1	1	0
Phan	94	4	4	12
Muang Chiang Rai	243	20	32	130
Mae Chan	115	10	14	23
Mae Fah Luang	12	7	7	10
Mae Lao	30	1	1	5
Mae Suai	33	6	6	8
Mae Sai	77	13	21	43
Wiang Kaen	5	3	3	1
Wiang Chai	42	1	1	4
Wiang Chiang Rung	10	2	2	1
Wiang Pa Pao	81	4	4	10
Total	918	100	133	318

Source: compiled by the authors.

Table 3 reports data for waste management in Chiang Rai Province. Out of 144 local governments, only about half or 71 have provided a waste collection service either by their own crews or private contractors. Villages in the areas without the service have to organize themselves, for example, by allocating empty land as a dumpsite or worse by open burning. Based on the Department of Local Administration (DLA)'s data after some checks and corrections, it is estimated that 455,796 tons of waste were generated in 2017. The amount of waste from tourists was estimated in a previous study for less than 2% of total waste generation (Manomaivibool et al. 2018a).

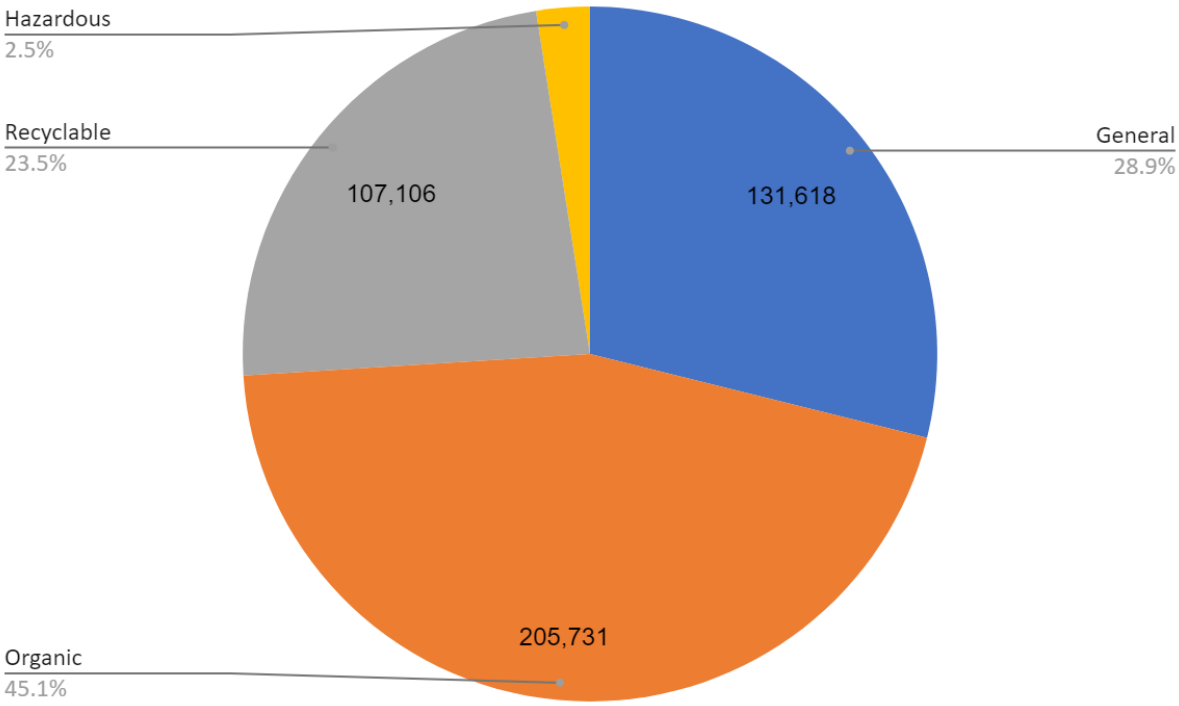
Table 3. Waste management data of Chiang Rai Province in 2017.

District	No. of LGs with waste collection service [a]	Waste Generation [a] (t/y)	Tourist Waste [b] (t/y)	Share of Tourist Waste [b] (%)

Khun Tan	2	12,176	68	0.56%
Chiang Khong	4	24,319	397	1.63%
Chiang Saen	3	17,501	944	5.39%
Doi Luang	0	6,684	0	0.00%
Thoeng	3	31,577	372	1.18%
Pa Daet	5	9,506	39	0.41%
Phaya Mengrai	3	15,012	29	0.19%
Phan	4	40,284	236	0.59%
Muang Chiang Rai	9	97,397	2,391	2.45%
Mae Chan	8	35,089	592	1.69%
Mae Fah Luang	4	25,379	303	1.19%
Mae Lao	3	10,508	79	0.75%
Mae Suai	5	29,503	253	0.86%
Mae Sai	9	38,347	921	2.40%
Wiang Kaen	2	12,944	97	0.75%
Wiang Chai	3	16,368	69	0.42%
Wiang Chiang Rung	1	9,053	76	0.84%
Wiang Pa Pao	3	24,149	291	1.21%
Total	71	455,796	7,157	1.57%

Source: [a] Department of Local Administration, [b] Manomaivibool et al. (2018a)

Figure 1 shows the composition of waste generated in Chiang Rai Province in 2017. The fraction with the largest share was organic waste (45.1%) although its share has dropped from 60% in the past (PCD, 2004). Plastic waste could be found in both general waste (e.g. snack bags, straws, single-use plastics) and recyclables (e.g. PET bottles, HDPE bottles, HDPE bags).



Source: Department of Local Administration
Figure 1. The composition of waste in Chiang Rai.

Table 4 estimates the fate of municipal solid waste (MSW) after generation. There are 3 main options available for households and other waste generators, as shown in Figure 2. First, they could separate and manage some waste at source. Chiang Rai has promoted the use of simple home composters called sawians and greencones for organic waste (Manomaivibool et al. 2018b). Recycleables could be sorted and sold to junk shops. Many villages and communities had a garbage bank that did not only accept high-value items like plastic bottles, but also served as an aggregate point for low-value items like plastic bags that could be baled or processed into refuse-derived fuels (RDFs). Since 2017, CR PAO has operated a D-ToC system developed by MFU to coordinate the separation and collection of household hazardous waste (HHW) from the other 143 local governments with some 20 tons sent for safe disposal in the first year. In total, based on the source separation model (Manomaivibool and Dokmaingam 2016) it was estimated that at maximum 157,751 tons were managed at source. Second, 144,475 tons were collected in the 71 areas where the services were available. Doi Luang was the only district back in 2017 that had no waste collection by any of the 3 local governments. 69% of the collected waste or about 100,000 tons per year were sent to the 3 sanitary landfills or burned by waste incinerators. The other 40,000 tons would end up at open dump sites that scattered around the province. The remaining 157,687 tons after management at source and public collection were assumed to be littered. Waste that was littered or put in improper disposal sites that had insufficient safeguarding measures could leak to the rivers and the ocean, which is the focus of this study.

Table 4. Fates of municipal solid waste in Chiang Rai in 2017.

District	Management At Source [a] (t/y)	Public Collection [b] (t/y)	Littering [a] (t/y)
Khun Tan	4,951	1,591	5,634
Chiang Khong	7,202	7,408	9,945
Chiang Saen	4,894	5,534	7,460
Doi Luang	2,073	0	4,612
Thoeng	13,437	3,129	15,109
Pa Daet	3,784	3,976	1,811
Phaya Mengrai	4,633	4,217	6,283
Phan	15,583	4,418	20,283
Muang Chiang Rai	21,818	58,106	18,822
Mae Chan	12,852	10,108	12,475
Mae Fah Luang	15,283	5,889	4,207
Mae Lao	3,138	2,563	4,853
Mae Suai	14,646	5,428	9,520
Mae Sai	12,999	21,385	4,917
Wiang Kaen	5,750	1,667	5,526
Wiang Chai	4,786	4,182	7,549
Wiang Chiang Rung	2,588	795	5,720
Wiang Pa Pao	7,334	4,079	12,961
Total	157,751	144,475	157,687

Source: [a] Estimated by the authors, [b] Department of Local Administration

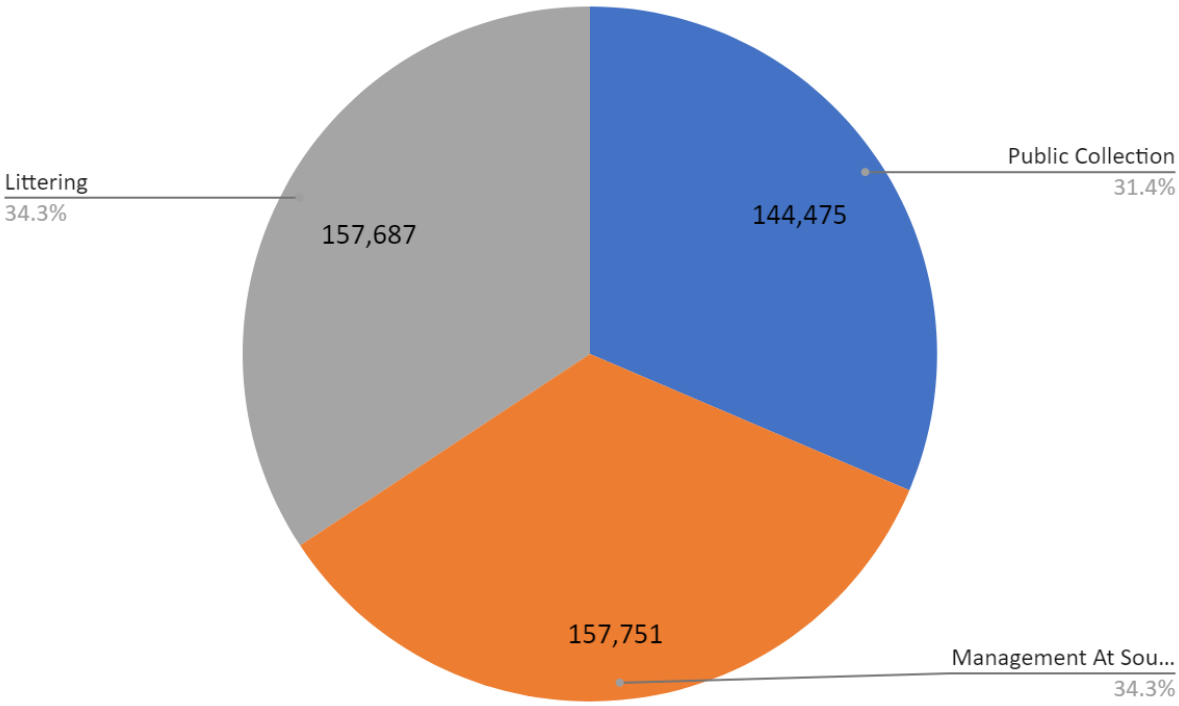


Figure 2. Fates of municipal solid waste in Chiang Rai in 2017.
Source: Estimated by the authors, Department of Local Administration.

4. Collection of Primary Data

4.1 Physical Inspection of Local Hotspots

Planning and Site Selection

This project focuses on two types of local hotspots that can potentially leak plastic waste into the environment: dumpsites and artificial barriers. A broader sense of the term “dumpsite” is used to cover not only open dumps that receive waste from public collection but also littering hotspots. For the former, lists of dumpsites in Chiang Rai are available from the Department of Local Administration (DLA) and the Pollution Control Department (PCD). Table 5 shows PCD’s list which includes information on size, treatment method, and location of 90 sites in Chiang Rai. After the discussion with project liaison in December and January, site visits to validate the location and the status of dumpsites in Chiang Rai was planned in February 2020. Local governments were approached to obtain permission to enter the site. The details of field inspection will be described in the next section.

Table 5. Waste disposal sites in Chiang Rai.

ID	District	Since (Year)	Size (Rai)	Methods	UTM_X	UTM_Y	LATITUDE	LONGITUDE

129	Muang	1996	323.00	Sanitary Landfill	598471	2184743	19.755904	99.939885
130	Muang	2001	1.00	Incinerator	588052	2211462	19.997827	99.84172
131	Muang	2007	5.00	Open dump	584194	2208763	19.97361	99.804719
132	Muang	2013	1.00	Incinerator	581302	2204811	19.938024	99.776905
133	Muang	2010	1.00	Incinerator	590034	2195238	19.85114	99.859872
134	Chiang Saen	1999	100.00	Open dump	612978	2245409	20.303243	100.08208
135	Chiang Saen	1994	100.00	Control Dump	612910	2245317	20.302416	100.081423
136	Chiang Khong	2007	2.00	Open dump	638140	2213772	20.015775	100.320626
137	Chiang Khong	2007	1.00	Open dump	642235	2216859	20.043368	100.360006
138	Chiang Khong	1993	24.75	Open dump	646133	2241683	20.267333	100.399266
139	Chiang Khong	2004	2.50	Open dump	637861	2222881	20.098088	100.318646
140	Chiang Khong	2004	1.00	Open dump	636285	2213752	20.015726	100.302894
141	Wiang Kaen	2004	3.80	Open dump	659218	2222771	20.09545	100.522867
142	Wiang Kaen	2006	1.00	Open dump	655189	2222118	20.08988	100.484285
143	Wiang Kaen	1997	1.00	Open dump	655397	2220041	20.0711	100.486097
144	Wiang Kaen	1997	1.00	Open dump	654564	2214236	20.018727	100.477642
145	Wiang Kaen	2011	1.00	Open dump	655018	2213821	20.014942	100.481946
146	Wiang Kaen	n/a	n/a	Open dump	654699	2213895	20.015635	100.478903
147	Thoeng	2002	10.20	Control Dump	618587	2173412	19.652415	100.131143
148	Thoeng	2011	4.00	Incinerator	624662	2177297	19.687142	100.189339
149	Thoeng	2010	3.00	Open dump	611994	2165525	19.581536	100.067793
150	Thoeng	2010	1.00	Open dump	611370	2161596	19.546071	100.061612
151	Thoeng	2010	2.00	Control Dump	608425	2164511	19.572573	100.033711
152	Thoeng	2011	1.00	Open dump	613003	2165817	19.584118	100.07743
153	Thoeng	2010	1.00	Open dump	608322	2165338	19.580051	100.032776
154	Thoeng	2010	1.00	Open dump	611466	2166387	19.589355	100.062811
155	Thoeng	2010	1.00	Control Dump	608481	2161072	19.541496	100.034046
156	Thoeng	2008	1.00	Control Dump	616187	2168591	19.608998	100.107955
157*	Mae Lao	2000	60.00	Open dump	568002	2180113	19.715356	99.648913
158*	Mae Lao	1995	62.00	Open dump	579636	2186172	19.76967	99.760183
159	Mae Lao	1995	n/a	Control Dump	579619	2186121	19.76921	99.760019
160	Mae Lao	n/a	n/a	Control Dump	579569	2186098	19.769004	99.759541
161	Mae Lao	2007	2.00	Open dump	575944	2190414	19.808148	99.725116
162	Mae Lao	n/a	n/a	Open dump	576200	2190530	19.809186	99.727565
163	Mae Lao	2007	5.00	Control Dump	576910	2192166	19.823941	99.734412
164	Mae Lao	2007	12.00	Open dump	579308	2189609	19.80074	99.757199
165	Mae Lao	2010	3.00	Open dump	579378	2190249	19.806521	99.757895
166	Wiang Chiang Rung	2002	12.00	Open dump	609607	2210979	19.992364	100.04772
167	Wiang Chiang Rung	2012	2.00	Open dump	606713	2204490	19.933896	100.019683
168	Wiang Chiang Rung	2013	1.00	Open dump	606587	2206462	19.95172	100.018594
ID	**District**	**Since (Year)**	**Size (Rai)**	**Methods**	**UTM_X**	**UTM_Y**	**LATITUDE**	**LONGITUDE**
169	Wiang Chai	2005	29.30	Control Dump	597825	2197366	19.869993	99.934386

170	Wiang Chai	2010	1.00	Open dump	611968	2200267	19.895445	100.069634
171	Wiang Pa Pao	2012	1.00	Incinerator	556738	2132901	19.289068	99.540012
172	Wiang Pa Pao	2012	1.00	Incinerator	556738	2132901	19.289068	99.540012
173	Wiang Pa Pao	1995	5.00	Open dump	553183	2122452	19.194736	99.505888
174	Wiang Pa Pao	1997	10.00	Open dump	551640	2124960	19.217441	99.491279
175	Wiang Pa Pao	2009	5.00	Open dump	556718	2118964	19.163119	99.53941
176	Wiang Pa Pao	1997	4.00	Open dump	607431	2150958	19.450165	100.023464
177	Pa Daet	2005	22.00	Open dump	600368	2151113	19.451933	99.956192
178	Pa Daet	2004	4.00	Open dump	604731	2163702	19.565461	99.998452
179	Pa Daet	2012	7.00	Open dump	605592	2157955	19.513487	100.006337
180	Pa Daet	2012	0.25	Open dump	599216	2158918	19.522516	99.945628
181	Mae Chan	2007	3.25	Control Dump	602800	2234337	20.203782	99.983978
182	Mae Chan	2011	1.50	Incinerator	588423	2236453	20.223618	99.84648
183	Mae Chan	2005	10.00	Control Dump	591861	2227885	20.146041	99.878955
184	Mae Chan	2013	1.00	Control Dump	592702	2230893	20.173179	99.887155
185	Mae Chan	2013	1.00	Incinerator	584337	2232372	20.186928	99.807177
186	Mae Chan	2005	2.00	Open dump	589660	2229009	20.156301	99.857953
187	Mae Chan	2010	1.00	Open dump	583630	2228022	20.147654	99.800211
188	Mae Chan	2008	1.00	Open dump	574930	2221909	20.092776	99.716719
189	Mae Chan	2013	1.00	Open dump	573945.23	2223216.72	20.1046	99.7074
190*	Mae Suai	2009	5.00	Control Dump	557159	2172497	19.646878	99.545214
191	Mae Suai	2010	0.25	Open dump	555996	2190485	19.809461	99.534661
192	Mae Suai	2012	0.13	Open dump	549461	2197647	19.874356	99.472457
193	Mae Suai	2008	1.00	Open dump	548077	2167186	19.599125	99.458451
194	Mae Sai	2009	95.00	Sanitary Landfill	591000	2256007	20.400174	99.872137
195	Mae Sai	1998	67.50	Sanitary Landfill	589743	2243764	20.289615	99.859479
196	Phaya Mengrai	2012	7.00	Open dump	627281	2193568	19.833982	100.215435
197	Phaya Mengrai	1993	30.00	Open dump	621646	2197447	19.869387	100.161889
198	Phaya Mengrai	2001	1.00	Open dump	615734	2183177	19.740814	100.104539
199	Phaya Mengrai	1993	1.50	Open dump	617938	2189691	19.799538	100.125983
200	Phaya Mengrai	2007	1.00	Open dump	618604	2202288	19.913312	100.133149
201	Phaya Mengrai	2007	1.00	Control Dump	617901	2199914	19.891906	100.126281
202	Phaya Mengrai	1989	2.00	Open dump	627388	2204561	19.933294	100.217215
203	Phaya Mengrai	1989	2.00	Open dump	627085	2205739	19.943957	100.214402
204	Phaya Mengrai	2012	1.00	Open dump	625508	2209528	19.978292	100.199593
205	Phaya Mengrai	2012	0.50	Open dump	623465	2211654	19.99763	100.180213
206*	Phan	1977	3.00	Control Dump	577589	2163185	19.562035	99.739691
207	Phan	2007	0.50	Control Dump	573149	2175464	19.673162	99.697844
208	Phan	2007	0.25	Control Dump	569904	2176250	19.680382	99.666917
209	Phan	2007	0.25	Control Dump	573301	2174678	19.666053	99.699263
ID	**District**	**Since (Year)**	**Size (Rai)**	**Methods**	**UTM_X**	**UTM_Y**	**LATITUDE**	**LONGITUDE**
210	Phan	2012	0.25	Control Dump	574385	2172074	19.642482	99.7095

211	Phan	2011	0.25	Control Dump	575560	2177800	19.694179	99.720938
212	Phan	2011	1.00	Open dump	576120	2173921	19.659106	99.726123
213	Phan	2011	1.00	Open dump	577846	2170987	19.632527	99.742464
214	Mae Fah Luang	1996	5.00	Open dump	570948	2237965	20.238007	99.67926
215	Mae Fah Luang	2011	10.00	Open dump	571122	2245949	20.310142	99.681241
216	Mae Fah Luang	2007	3.00	Open dump	570925	2237070	20.229921	99.679005
217	Mae Fah Luang	2007	0.50	Open dump	569962	2236668	20.226324	99.66977
218	Mae Fah Luang	2012	1.00	Open dump	563769	2228967	20.156954	99.610214

Source: Pollution Control Department. * selected for physical survey.

Artificial barriers are constructed in tributary rivers of Mekong. Weirs are commonly found in Mae Chan, Mae Sai, and Chiang Saen Districts. Table 6 lists 25 weirs managed by the Royal Irrigation Department and local governments in the 3 districts. The field inspection selected a few of these and collected data on their location and plastic waste that could be found stuck to the barriers.

Table 6. Weirs in the tributary rivers of Mekong in Mae Chan, Mae Sai and Chiang Saen Districts, Chiang Rai Province.

No.	**Tributary River**	**Sub-district**	**District**	**Type of Weir/Authority**
1	Mae Kham river (1)	Mae Kham	Mae Chan	RCC/RID
2	Mae Kham river (2)	Sri Kham	Mae Chan	RCC/RID
3	Mae Kham river (3)	Jan Jwa Tai	Mae Chan	Rockfill
4	Mae Kham river (4)	Jan Jwa Tai	Mae Chan	none
5	Mae Kham river (5)	Baan Dye	Mae Sai	RCC/RID
6	Mae Kham river (5)	Sri Don Moon	Chiang Saen	RCC/Local Government Authority
7*	Mae Chan river (1)	Pa Teung	Mae Chan	RCC/Local Government Authority
8*	Mae Chan river (2)	Mae Chan	Mae Chan	RCC/Local Government Authority
9*	Mae Chan river (3)	Mae Chan	Mae Chan	RCC/Local Government Authority
10	Mae Chan river (4)	San Sai	Mae Chan	RCC/Local Government Authority
11*	Mae Chan river (5)	Sri Kham	Mae Chan	RCC/Local Government Authority
12	Mae Chan river (6)	Jom Sawan	Mae Chan	RCC/Local Government Authority
No.	**Tributary River**	**Sub-district**	**District**	**Type of Weir/Authority**
13	Mae Chan river (7)	Jom Sawan	Mae Chan	RCC/Local Government Authority
14	Mae Chan river (Tributary)	Jom Sawan	Mae Chan	RCC/Local Government Authority

15	Mae Chan river (Tributary)	Jan Jwa Tai	Mae Chan	RCC/Local Government Authority
16	Mae Chan river (Tributary)	Jom Sawan	Mae Chan	RCC/Local Government Authority
17	Mae Chan river (Tributary)	Jan Jwa Tai	Mae Chan	RCC/Local Government Authority
18	Mae Chan river (Tributary)	Jan Jwa	Mae Chan	RCC/Local Government Authority
19	Mae Chan river (8)	Jan Jwa Tai	Mae Chan	RCC/Local Government Authority
20	Mae Chan river (9)	Jan Jwa Tai	Mae Chan	RCC/Local Government Authority
21	Mae Chan river (10)	Pa Sak	Chiang Sean	RCC/Local Government Authority
22	Mae Chan river (11)	Pa Sak	Chiang Sean	RCC/Local Government Authority
23	Mae Chan river (12)	Jan Jwa Tai	Mae Chan	RCC/Local Government Authority
24	Mae Hang river (Floodway of Mae Chan and Mae Kham river)	Pa Sak	Chiang Sean	RCC/Department of Water Resources

Source: Royal Irrigation Department. * selected for physical survey.

Implementation

A team from MFU had conducted physical inspection of local hotspots between 28 February and 6 March, 2020. Disposal sites no. 157, 158, 190 and 206 in Table 5 were visited with assistance from respective local governments for directions. Data collection followed the "User guide for the data collection application" developed by GIC, AIT. Table 7 shows the data template for the inspection of dumpsites. Data was collected and sent through the GIC's mobile application. Because the dumpsite in Dong Mada sub-district had two pits, as shown in Figure 3, their information was recorded separately.

Table 7. Data template for the inspection of dumpsites.

Mobile App. Survey (Illegal Dump)			
ITEM		**DETAIL**	**Result**
1	Address of the selected illegal dump	Ward, Division, Municipality, Province	

2	Frequency of cleaning of the accumulated wastes at the barriers if any	Who, When, How, last date of cleaning	
3	Estimate total volume of accumulated wastes	Length (m), Width (m), and Height (m)	
4	Take photos with GPS	Panoramic/focused photos	Please take photos with your mobile phone and upload the photo to the mobile app.

Source: GIC, AIT.

Source: Google Map.

Figure 3. The two pits at Dong Mada dumpsite, Mae Lao District, Chiang Rai Province.

Weirs No. 7-10 in Table 6 were selected for the physical inspection. One additional weir was found on the way to the pre-selected site. The final samples covered 5 sites. Similar to the dumpsites, the data collection followed GIC's guideline and mobile application. In addition to basic attributes of the site, the field surveyors were requested to count different types of plastic waste found at the barriers. Table 8 shows the data template for the inspection of artificial barriers.

Table 8. Data template for the inspection of artificial barriers.

Mobile App. Survey (Artificial barrier)				
ITEM			**DETAIL**	**Result**
1	Address of the artificial barrier		Ward, Division, Municipality, Province	
2	Frequency of cleaning of the accumulated wastes at the barriers		Who, When, How, last date of cleaning	
3	Estimate total amount of accumulated wastes		How many 20-litter plastic bag or container?	
4	Identify type of accumulated plastic wastes			
4-1	Food Wrappers (more than 2.5cm)		Rough counting (piece)	
4-2	Plastic Beverage Bottle		Rough counting (piece)	
4-3	Plastic Shopping Bag (more than 2.5cm)		Rough counting (piece)	
4-4	Plastic cup, plate, utensils (more than 2.5cm)		Rough counting (piece)	
4-5	Styrofoam (more than 2.5cm)		Total Rough Volume (cm x cm x cm)	
4-6	Other specific plastic if any (more than 2.5cm)		Rough counting (piece)	
5	Take photos with GPS		Panoramic/focused photos	Please take photos by your moilephone and upload the photo to the mobile app.

Source: GIC, AIT.

Results & Discussion

Table 9 reports key attributes of the dumpsites inspected by the team from MFU. The locations were double checked with the PCD's list. It was found that PCD reports the location at the entrance of each site while the location in Table 9 is right in the middle of the site. Figure 4 shows an example of the slight difference in location recorded. All sites visited were managed by local governments but the extent of site monitoring was at minimum. Only one municipality reported that they would attempt to clear and bury the waste once a year. Figure 5 shows how waste was accumulated at the dumpsites which was between 1-4 meters high at the time of inspection. In

addition to the dumpsites, the field surveyors also recorded data of local littering hotspots found along the ways via the mobile application.

Table 9. Attributes of dumpsites in the physical inspection in 2020.

No	ID	Field survey						
		Date	Address	Waste Pile (m)			Management	Location
				L	W	H		
1	158	2020-02-04	Moo 12, Pa Kor Dam, Mae Lao, Chiang Rai	50	30	2	The municipality will dig a hole to bury waste once a year	19.7692460, 99.7596560
2	157	2020-02-28	Moo 9, Dong Mada, Mae Lao, Chiang rai	90	25	1	The municipality dumps collected waste here	19.715357, 99.649122
				50	12	4		19.714284, 99.648263
3	190	2020-02-28	Moo 7, Mae Suai, Mae Suai, Chiang Rai	200	30	3	The municipality dumps collected waste here	19.646281, 99.544796
4	206	2020-03-02	Moo 2, Muang Phan, Phan, Chiang Rai	120	70	2	The municipality dumps collected waste here	19.561611, 99.739639

Source: compiled by this study.

Source: Google Map.

Figure 4. Locations recorded for dumpsite no. 158 in Mae Lao District.

No.158

No. 157 (A)

No.157 (B)

No.190

Photo credit: Wisaroon Sutthanoo & Naratip Tiwaras

Figure 5. Waste accumulated at dumpsites in Chiang Rai Province.

No. 206

Photo credit: Wisaroon Sutthanoo & Naratip Tiwaras
Figure 5. Waste accumulated at dumpsites in Chiang Rai Province (cont).

Table 10 reports plastic waste trapped with the weirs at the time of the inspection. The most common items found were plastic bags followed by bottles and foam containers. Figure 6 shows examples of the waste found (circled) during the inspection.

Table 10. Plastic waste found at artificial barriers in the tributary rivers of Mekong in 2020.

No.	Date	Length (m)	20 Liter	Wrap-per	Bottle	Bag	Utensil	Foam	Other	Dropped Pin
7	2020-03-06	60	1	1	6	14	-	7	3	20.1168511, 99.7995046
8	2020-03-06	60	-	1	12	10	1	4	2	20.1316640, 99.8407345
9	2020-03-06	40	-	4	8	50	-	7	4	20.1593497, 99.8616467
11	2020-03-06	20	1	2	4	18	-	3	-	20.1641230, 99.8625442
n/a	2020-03-06	12	-	1	10	7	-	2	2	20.1412100, 99.8500100


No.7


No.7

No.8

No.8

No.9

No.9

Photo credit: Wisaroon Sutthanoo & Naratip Tiwaras

Figure 6. Plastic waste found at the weirs inspected in Chiang Rai Province.

No.11

No.11

n/a

n/a

Photo credit: Wisaroon Sutthanoo & Naratip Tiwaras
Figure 6. Plastic waste found at the weirs inspected in Chiang Rai Province (cont).

4.2 Collection of Macroplastics in Mekong

Planning and Site Selection

The team from MFA, GIC and UNEP had surveyed potential sites in Chiang Rai in September 2019. In total 9 sites were surveyed as shown in Table 11, including 3 sites that could allow sampling of plastic waste in Mekong itself. Chiang Saen Port II was initially the prime candidate for the site selection. However, the current at the site tended to take waste away from the port. On the other hand, at Chiang Saen Port I the platform has created a barrier that traps debris floating along the river. Chiang Khong does not have a proper site and would require a complete set up of nets to trap plastics. The team received invaluable inputs from stakeholders from the government, local governments, private sector, and local environmental groups (Figure 7). Some visits also featured the collection of microplastics carried out by Pirika Inc., which was probably the first being conducted in Mekong (Figure 8).

Table 11. Planning and preliminary survey activities.

Date	**Location**	**Stakeholders**
20 Sep 2019 (morning)	Chiang Saen Port II Ban Saeo Sub-district, Chiang Saen District	District Chief of Chiang Saen / Port Authority / Wiang Chiang Saen Sub-district Municipality / Ban Saeo Sub-district Municipality
20 Sep 2019 (afternoon)	Chiang Saen Port I Wiang Sub-district, Chiang Saen District	Port Authority / Wiang Chiang Saen Sub-district Municipality

20 Sep 2019 (afternoon)	Mekong Riverfront Ban Saeo Sub-district, Chiang Saen District	Ban Saeo Sub-district Municipality
21 Sep 2019 (morning)	Mae Kam Riverfront Mae Jan Sub-district, Mae Jan District	Mae Jan Sub-district Municipality
21 Sep 2019 (afternoon)	Mae kok Riverfront Muang Sub-district, Mae Jan District	Trash hero Chiang Rai
22 Sep 2019 (morning)	Mekong River Wiang Sub-district, Chiang Khong District	Rak Chiang Khong Conservation Group
22 Sep 2019 (afternoon)	Mae Ing River Wiang Sub-district, Thoeng District	Wiang Thoeng Sub-district Municipality
23 Sep 2019 (morning)	Nam Ruak River Wiang Sub-district, Chiang Saen District	Anantara Hotel
23 Sep 2019 (morning)	Nam Ruak River Mae Sai Sub-district, Mae Sai District	Royal Irrigation Department (Mae Sai Office)

Source: Compiled by the authors.

Photo credit: Pattawee Prakong and Wisaroon Sutthanoo

Figure 7. Stakeholder consultations and a preliminary survey for site selection in Sept 2019.

Photo credit: Pattawee Prakong and Wisaroon Sutthanoo

Figure 8. Collection of microplastics in Chiang Rai Province in Sept 2019.

After the preliminary survey, it was decided that Chiang Saen Port I was the best location for the collection of macroplastics. The team from MFU had a meeting with Wiang Chiang Saen Sub-district Municipality and the Port Authority on 19 February 2020 to plan for the setting and implementation.

Implementation

Chiang Saen Port I is located on the bank of Mekong River in Wiang Sub-district, Chiang Saen District. It was the main port in the area and had shipments of goods between Thailand, China, Laos and Myanmar. Since Chiang Saen Port II was in operation, it has become a port for tourists. The river cruise is popular among Chinese tourists who visit the Golden Triangle and the casino, King Roman on the Lao side of Mekong. However, during the survey all activities were in a complete halt due to the new coronavirus, COVID-19 outbreak. This might affect the quantity of plastic waste found in this study.

The outlay of the port makes the current flows into the areas highlighted in Figure 9. This provided a favourable condition to collect macroplastics. In this study, we set a net at Point A. Waste was collected twice a day at 8.00 am and 5.00 pm between 6 and 12 March 2020. In addition,

macroplastics brought by whirlpool were cleared from Point B everyday during the period. Figure 10 shows how the sampling was carried out by a team from Wiang Chiang Saen Sub-district Municipality.

Source: Google Map.

Figure 9. Waste collection spots at Chiang Saen Port I.

Point A

Point A

Point A

Point A

Point B

Figure 10. Collection of waste at Chiang Saen Port I in March 2020.

Information of the collected waste was first recorded onsite. The team from Wiang Chiang Saen Tambon Municipality classified waste into plastic and non-plastic products. Plastic waste was then further classified by categories based on Break Free From Plastic (BFFP)'s brand audit data card and Ocean Conservancy's volunteer ocean trash data form (see Appendix B). Initially 7 categories were set: FP for food packaging, PC for personal care products, HP for household products, SM for smoking materials, FG for fishing gears, PM for packing materials, and O for other or unknown items. A category of chemical and medicine (CM) was identified during the exercise on 6 March, which found a number of items belonging to this new category. Then, within

a product group, they were identified by brands, countries of origin, and resins. For example, plastic bottles were grouped by brands, countries and then classified into PET, HDPE and PP for the bottles and the caps. Products of the same subgroups and brands were assigned a number for each round of collection, photographed, counted and weighed. Containers were emptied before weighing. The exceptions were CM that were weighed with the content for safety reasons. Details such as emptying the content, cap removing, no cap found, etc. were noted in the form. The daily raw data (in Thai) can be found as supplementary materials: https://drive.google.com/open?id=1m0C6bE-bhVjRIW81oss9brOS3CauyIFI.Figure 11 shows the data collection activities.

Figure 10. Recording data about waste found in Mekong.

Data coding was verified by researchers at MFU who checked the types of plastics with the photographs submitted by the municipal team. Further details, for example, whether the plastic items were single or multiple layers and the ownership of the brands were further identified in this second round. The next section reports the results from the analysis of 7 days worth of data collection on macroplastics found in Mekong at Chiang Saen Port I.

Results & Discussion

Table 12 reports the number in pieces and weight in kilograms of waste found in Mekong at Chiang Saen Port I between 6 and 12 March 2020. Figures 11 and 12 show that although plastics dominated in terms of number of items but they were lightweight. The difference in weight between plastic and non-plastic items was not as great as their numbers. The decreasing trend of waste found might reflect the worsening of the outbreak. The municipal team remarked that the amount was considerably lower than what they found in the usual clean-up at the port in which waste was cleared at Point B.

Table 12. Number and weight of waste in Mekong, between 6 and 12 March, 2020.

Date	Number (piece)			Weight (kg)		
	Plastics	Non-plastics	Total	Plastics	Non-plastics	Total
6-Mar-20	483	173	656	13.30	9.46	22.76
7-Mar-20	206	60	266	24.61	8.08	32.69
8-Mar-20	173	51	224	1.78	7.18	8.96
9-Mar-20	172	30	202	3.23	4.87	8.10
10-Mar-20	194	43	237	2.48	3.63	6.11
11-Mar-20	184	85	269	4.01	5.24	9.25
12-Mar-20	175	36	211	2.40	3.08	5.48

Source: Compiled by the authors.

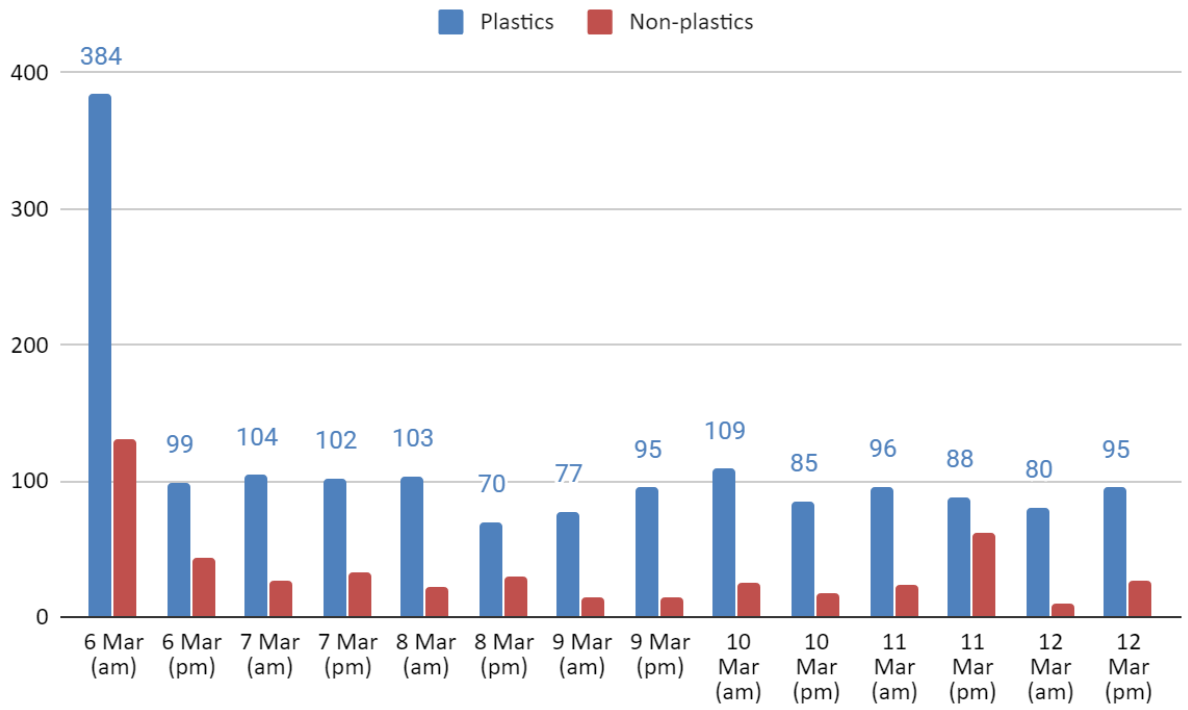


Figure 11. Number of waste (pieces) found in each round of collection.

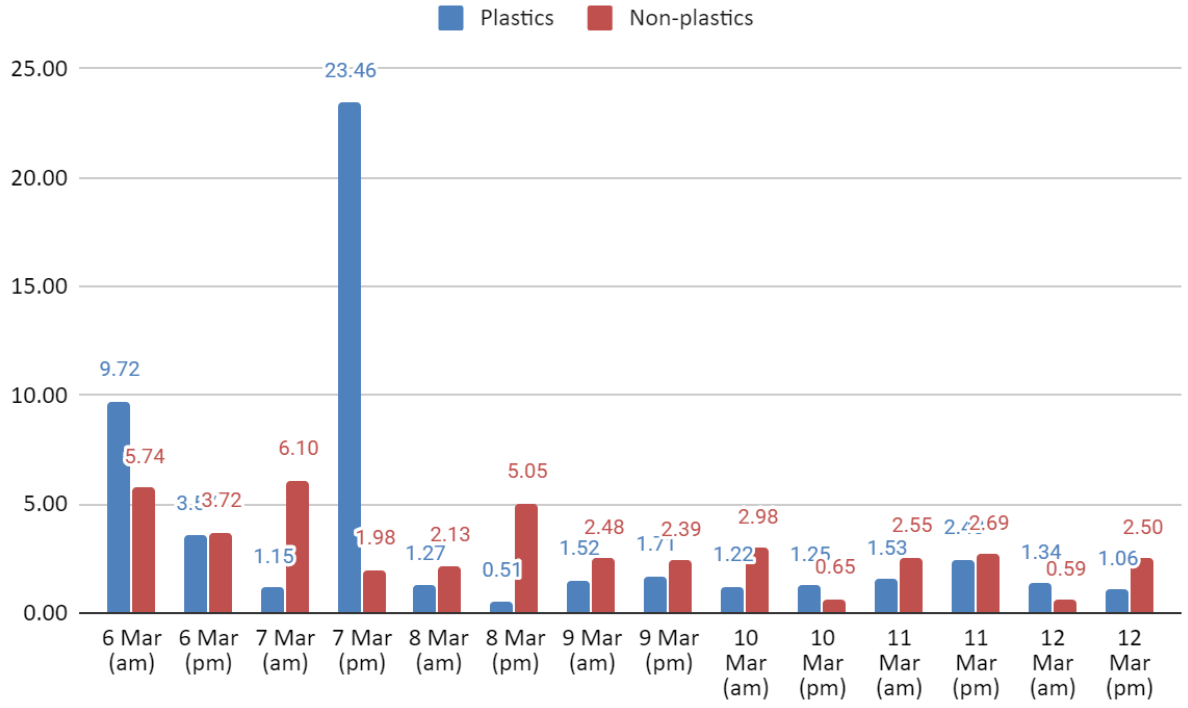


Figure 12. Weight of waste (pieces) found in each round of collection.

Figures 13 and 14 show the breakdown of plastic waste in terms of resins. By pieces, the most common items were made of polypropylene (PP) such as bottle caps, straws, food boxes and trays and cups. The second most common resin was polyethylene (PET) which was popular for beverage bottles. The third identifiable type of plastics was polystyrene (PS) which came in two main forms: FP and PM. Large pieces of packing materials made from PS could be found leading to the higher average weight for PS products. Table 13 also shows that more than half of the others were multi-layered packaging.

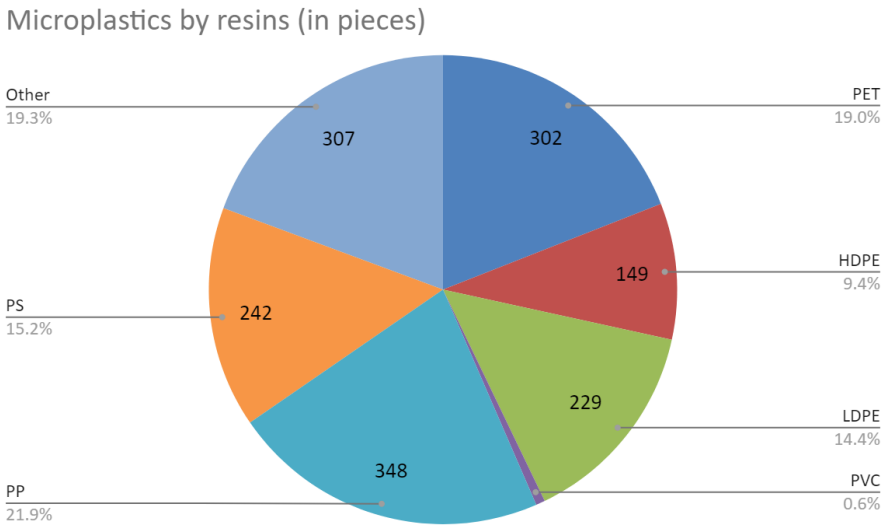


Figure 13. Composition of plastic waste in Mekong in pieces.

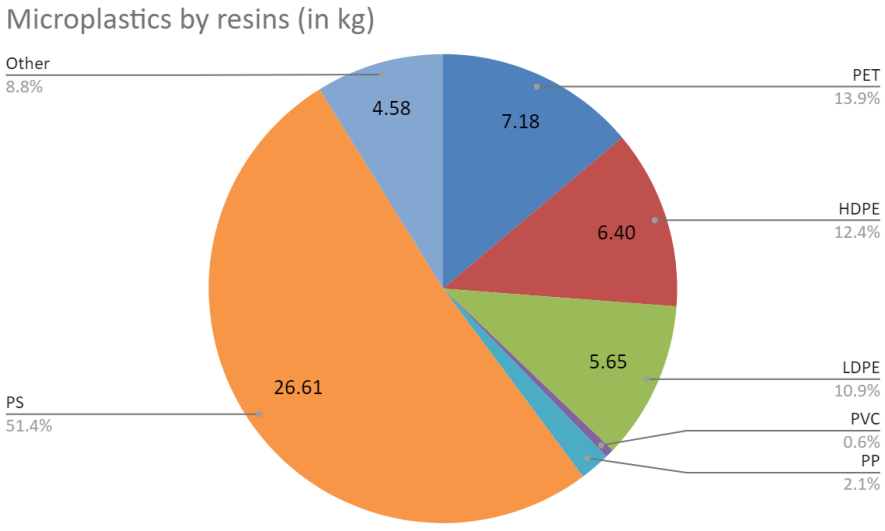


Figure 14. Composition of plastic waste in Mekong in kilograms.

Table 13. The types of plastic waste found in Mekong at Chiang Saen Port I by resin types.

Resin	Layer	Count (piece)	*%Count*	Weight (kg)	*%Weight*	Average Weight (g)
PET	SL	302	*100.0%*	7.18	*100.0%*	23.76
PET	ML	0	*0.0%*	0.00	*0.0%*	0.00
HDPE	SL	147	*98.7%*	6.39	*99.8%*	43.46
HDPE	ML	2	*1.3%*	0.01	*0.2%*	5.00
LDPE	SL	229	*100.0%*	5.65	*100.0%*	24.66
LDPE	ML	0	*0.0%*	0.00	*0.0%*	0.00
PVC	SL	10	*100.0%*	0.31	*100.0%*	31.20
PVC	ML	0	*0.0%*	0.00	*0.0%*	0.00
PP	SL	348	*100.0%*	1.08	*100.0%*	3.11
PP	ML	0	*0.0%*	0.00	*0.0%*	0.00
PS	SL	242	*100.0%*	26.61	*100.0%*	109.95
PS	ML	0	*0.0%*	0.00	*0.0%*	0.00
Other	SL	139	*45.3%*	1.98	*43.3%*	14.27
Other	ML	168	*54.7%*	2.59	*56.7%*	15.44

Source: Compiled by the authors.

Figure 15 breakdowns the plastic items into product categories. The category with the highest number was FP with over a thousand items found from the 7 days. HP was the distance second. Besides SM and FG, PM was the most homogenous category dominated by PS. Other categories featured products made of different resins. Because the producers made the choice over which materials they would use as products and packaging. The brands and their identities were also analyzed .

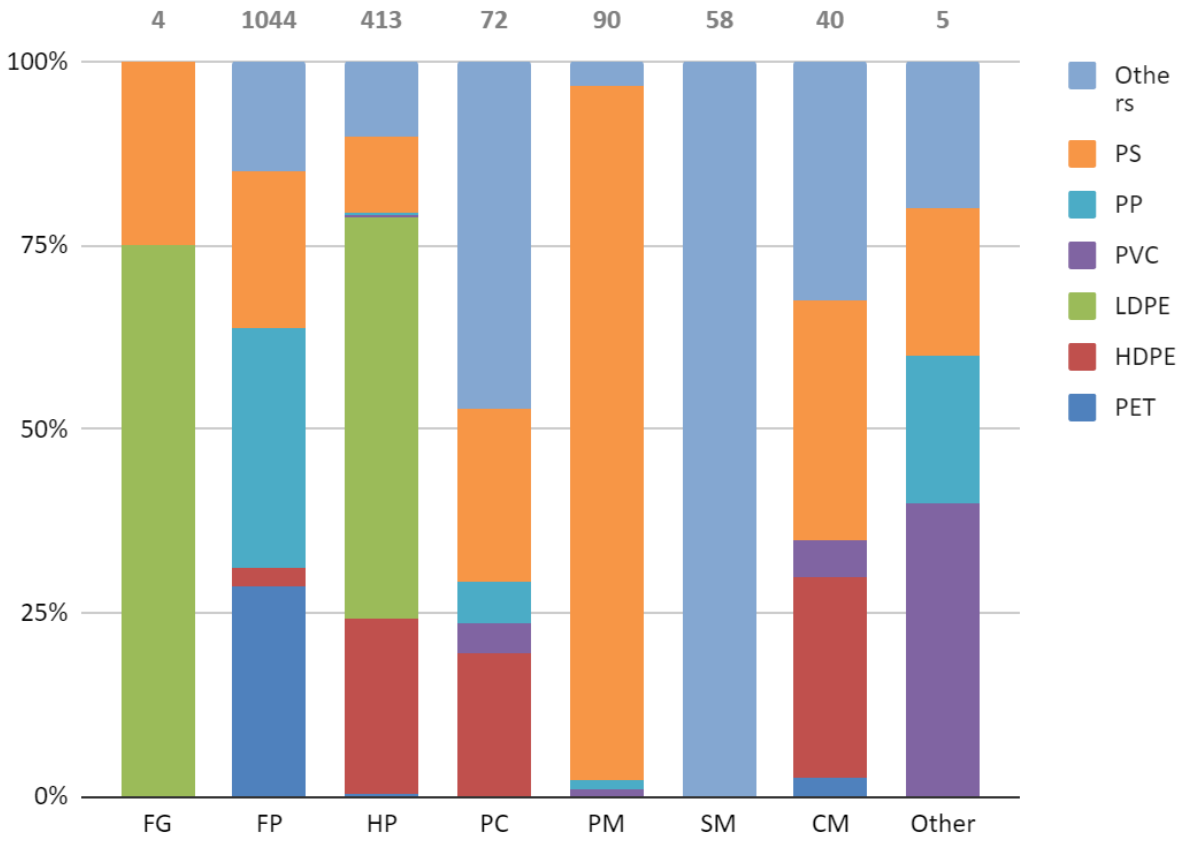


Figure 15. The plastic waste found in Mekong at Chiang Saen Port I by product categories.

Table 14 breakdowns plastic waste by brand ownership and country of origin. Only brands with more than 3 items identified were coded. The rest were tallied as “others” and identified by countries of origin. The producers with the highest numbers of their products found in this study were Singha, Berli Jucker (BJC) and Nestle. For those with non-identifiable brands, the majority were Thai products followed by Chinese, Myanmar, and Laotian.

Table 14. The breakdown of plastic waste by brand ownership and country of origin.

Brand Ownership	Country	Count (piece)	%Count	Weight (kg)	%Weight
AJE	Thailand	21	1.32%	0.06	0.11%
Ajinomoto	Thailand	8	0.50%	0.08	0.15%
BJC	Thailand	40	2.52%	0.56	1.09%
Cigarette	Thailand	39	2.46%	0.42	0.81%
Coca Cola	Thailand	22	1.39%	1.51	2.92%
CP	Thailand	4	0.25%	0.02	0.04%
Dutch Mill	Thailand	14	0.88%	0.85	1.63%
Food Star	Thailand	25	1.58%	0.12	0.24%
Foremost	Thailand	15	0.95%	0.07	0.14%
Lactasoy	Thailand	11	0.69%	0.17	0.34%
Nestle	Thailand	39	2.46%	0.55	1.05%
PepsiCo	Thailand	14	0.88%	0.15	0.30%
Sermsuk	Thailand	9	0.57%	0.40	0.77%
Singha	Thailand	54	3.40%	0.44	0.84%
Thai President Foods	Thailand	18	1.13%	0.62	1.21%
ThaiBev	Thailand	34	2.14%	0.08	0.16%
Tiger Head	Myanmar	16	1.01%	0.02	0.04%
Unilever	Thailand	9	0.57%	3.03	5.85%
Wahaha	China	27	1.70%	0.00	0.00%
Others	Thailand	103	6.49%	1.70	3.29%
Others	China	20	1.26%	0.29	0.56%
Others	Myanmar	6	0.38%	0.05	0.09%
Others	Laos	2	0.13%	0.00	0.00%
Others	n/a	14	0.88%	1.07	2.07%
Local	Thailand	80	5.04%	0.24	0.47%
Local	China	45	2.84%	0.05	0.10%
Local	Myanmar	48	3.02%	1.16	2.25%
Local	Laos	23	1.45%	0.84	1.62%
Local	n/a	12	0.76%	0.02	0.04%
n/a	Thailand	10	0.63%	0.49	0.94%
n/a	China	85	5.36%	0.79	1.53%
n/a	Myanmar	2	0.13%	0.00	0.00%
n/a	Laos	6	0.38%	0.59	1.14%
n/a	n/a	712	44.86%	35.33	68.20%

Source: Compiled by the authors.

5. Considerations for Future Research

This study is one of the first studies on plastic waste in the Greater Mekong Sub-region (GMS). Several issues remain for future work.

1. Seasonality. The field work was carried out in March 2020 in the middle of the dry season and the beginning of the global pandemic. The results might not represent the normalcy of the area and most likely underestimated the amount of plastic waste found in Mekong. Therefore, it should be repeated when things return to normal both during the dry and monsoon seasons.
2. Pathway. The flows of waste being littered or sent to improper disposal sites to the tributary rivers and then Mekong might not be well illustrated. Due to the extended drought experienced in the region, it was not likely that the dried up rivers would carry waste to Mekong in March 2020. The majority of macroplastics collected were likely from nearby activities. This is another reason to repeat the work in the monsoon season to see how waste can be carried away to the ocean.
3. Standardization. The methods of site selection, equipment setting, and documentation can benefit greatly from standardization. Sharing experiences between different teams on this project and beyond can pave the way for just that.

6. References

Department of Local Administration (DLA). 2018. *แบบสำรวจเพื่อจัดทำฐานข้อมูลด้านการบริหารจัดการขยะมูลฝอยขององค์กรปกครองส่วนท้องถิ่น (มฝ.1)* [The Survey Form for De veloping Database for Waste Management of Local Governments (Mor Phor.1)] (in Thai).

Manomaivibool, P. et al. 2018a. *Final Report: Efficiency, Competitiveness and Sustainability of Thai Tourism*. Bangkok: Thailand Research Fund.

Manomaivibool, P., Mongkonkorn, S., Unroj, P., Dokmaingam, P. 2018b. Chiang Rai Zero Waste: participatory action research to promote source separation in rural areas. *Resources, Conservation and Recycling*, 136, 142-152.

Pollution Control Department (PCD). 2004. *Final Report: Project on the Survey and Composition Analysis of Municipal Solid Waste in Thailand.* Pollution Control Department, Bangkok (in Thai).

Pollution Control Department. 2016. *ตารางแสดงภาพรวมสถานที่กำจัดขยะมูลฝอยของประเทศไทยปี 2559* [Table for Waste Disposal Sites in Thailand 2016] (in Thai).

Appendix A Data Collection Plan

Summary of the Work Plan for MFU and NUoL

1. Primary data collection

1.1 Sampling of macroplastics

Each team will select (at least) one site in the Mekong where plastic waste will get accumulated. The task will be easier, if there is an existing artificial barrier into the river like the port. The Chiang Saen Port 1 is selected for CR (Figure 1). A potential site in VT should be somewhere downstream of restaurants along the riverside.

Figure 1. Chiang Saen Port 1

The objective of the activity is to record the types and amounts of macroplastic waste found in the river. The work will be week long. Preferably the activity in VT should coincide with the Media Tour on 13-14 Feb. Metadata of the site will be filled in Sheet "3. WM in Mekong" of the spreadsheet (File name: 2. Data Inventory_20191223.v4.xlsx).

The data collection tool will follow Ocean Conservancy's Volunteer Ocean Trash Data Form (File name: 3-1. OC-DataCards_volunteerFINAL_ENG.v.2.pdf). Basically, plastic waste will be removed from the water once a day for 7 consecutive days at the same time (e.g. 4pm). They will be classified using the OC Form. No. of items, weights, and pictures will be recorded.

1.2 Survey of dumpsites

As a potential source of plastic waste, the location and the size of illegal dumps in each city will be collected. A dumpsite will be defined as a designated place where waste collected by municipalities or private waste management companies will be open-dumped. This definition excludes small piles of litters where villagers throw away their waste. It also does not include sanitary landfill and incinerators.

We will collect data of the illegal dumps with the mobile application developed by GIC/AIT, see the user guide (File name: 3-2. User guide for the data collection app.v2.pdf). Basically, we only record the location, address and pictures of the dumps. Then, we estimate the volume of waste

deposited by measuring the size (width*length*height by eyes as show in Figure 2 but if the site is large width and length can be measured using Google Map). We should interview local authorities that use or control the dumps about basic management practices especially whether and when there was an effort to clear waste at the dump, e.g. open burning to reduce the volume. Data of illegal dumps will be filled in sheet "4.2 V. Inspection_Dump" of the spreadsheet (File name: 2. Data Inventory_20191223.v4.xlsx).

Figure 2. Estimate the volume of waste at an illegal dump

1.3 Survey of artificial barriers

Artificial barriers along tributary rivers of Mekong provide opportunities to collect data for local hotspots to measure the actual leakage of plastic waste from local sources.

We will make a visual inspection of no. and types of plastic waste found in the location. Data of barrier inspection will be filled in sheet "4.1 V. Inspection_Barrier" of the spreadsheet (File name: 2. Data Inventory_20191223.v4.xlsx). Compared to the sampling of macroplastics, this activity only targets a few types that can easily be identified by naked eyes, as shown in the sheet. But, if this can be done in collaboration with clean-up activities, data on weights of collected waste can also be recorded.

Figure 3. Identify plastic waste at a barrier

1.4 Sampling of microplastics

Microplastics wil be collected from Mekong and tributary rivers by a team from Pirika. Local partners coordinate the sites for the activity. This had been carried out in CR in September 2019. In VT, the sites can be the same sites of 1.1 and some barriers in 1.3.

2. Secondary data collection

There are several data points listed in sheets "1. Data Inventory" and "2. Waste Management" of the spreadsheet (File name: 2. Data Inventory_20191223.v4.xlsx): demographic data, infrastructure, land-use, and waste management). Local partners will check data availability and accessibility and send the data that can be obtained to GIC/AIT.

Work Plan

The details of the work plan by tasks can be found in a spreadsheet (File name: Workplan.xlsx). Here, it is summarized chronologically. However, we need contracts to be concluded before doing any fieldwork as both universities have internal process to approve the activities.

Period	MFU	NUoL
13-24 Jan	Conclude the contract with UNEP and get a permission from the university to conduct the research	Conclude the contract with UNEP and get a permission from the university to conduct the research
25 Jan - 7 Feb	Conduct primary data collection 1.1 Sampling of macroplastics – fully 1.2 Survey of dumpsites – pilot 1.3 Survey of artificial barriers – pilot NB: the mobile app (at least beta) must be ready for 1.2 and 1.3 Check data availability in CR with GIC/AIT	First week, travel to CR to observe the data collection protocols. Second week, conduct a preliminary survey to select the sites for the activities in VT

Period	MFU	NUoL
8-21 Feb	Assist NUoL in setting up primary data collection	Conduct primary data collection 1.1 Sampling of macroplastics – fully 1.2 Survey of dumpsites – pilot 1.3 Survey of artificial barriers – pilot 1.4 Sampling of microplastics – fully This will be done with the Media Tour Check data availability in VT with GIC/AIT
	Attend the MRC Workshop and Media Tour in VT Have a debrief with partners for further data collection	
22 Feb- 7 Mar	Conduct primary data collection 1.2 Survey of dumpsites – fully 1.3 Survey of artificial barriers – fully Collect secondary data	Conduct primary data collection 1.2 Survey of dumpsites – fully 1.3 Survey of artificial barriers – fully Collect secondary data
8-28 Mar	Finalize data with GIC/AIT + Additional clean-up activities	Finalize data with GIC/AIT

The list of documents must prepare for UNEP for issuing the contract is as follows (templates are in the zip file: requirementforunepconsultancycontract.zip):

1. Copy of passport
2. Copy of her highest education degree/diploma
3. Physician's statement (template attached)
4. Health and Insurance self-certification (template attached)
5. Copy of Form P.2 B BE (Designation, Change or Revocation of Beneficiary for Consultants (template attached)
6. Fund transfer request form along with a void check or bank statement (template attached)
7. HR Mini Master form (template attached)
8. Letter of attestation from current employer/ in case of freelance please provide self explanation statement.
9. Create INSPIRA account and register in the consultant roster https://inspira.un.org/psc/REGISTER/EMPLOYEE/HRMS/c/HRS_HRAM.HRS_CE.GBL?Page=HRS_CE_HM_REG&languageCd=ENG

Appendix B Existing Data Forms

#breakfreefromplastic brand audit data card

Date(s) of Audit: ________________________ **City / Region:** __________________

Name of Lead: ________________________ **Country:** __________________

Organization: ________________________ **Area Covered:** ____ O M^2 O FT^2 O HOME/BUILDING

Total Collected: ______ (#) OF O BAGS O CONTAINERS *(check one)* **Num Volunteers:** _____

Volume of Each: ______ (#) OF O GALLONS O LITERS *(check one)*

Type of Audit: *(check one)* O COAST / SHORELINE O OCEAN / RIVER / LAKE O CITY / PARK / LAND O HOME O SCHOOL / OFFICE

Start Time: __________ AM PM **Latitude*:** ________________

End Time: __________ AM PM **Longitude*:** ________________

**Only if you can easily determine it*

Brand Name *(enter 'Unknown' if not clearly marked)*	Item Description	Type of Product* *(circle one)*	Type of Material† *(circle one)*	Layers^ *(circle one)*	Recycled Locally?	Count (e.g. 𝍸)	Total
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		
		FP PC HP SM FG PM O	PET HDPE PVC LDPE PP PS O	ML SL Unsure	☐		

***TYPE OF PRODUCT** *(Circle one in the column above)*			
FP	**Food Packaging:** e.g. bottles, cans, cutlery, foam, tubs, wrappers, chip bags, cups, straws	**SM**	**Smoking Materials:** e.g. cigarette butts, lighters, cigar tips, tobacco packaging
PC	**Personal Care:** e.g. soap, shampoo, medical, diapers, makeup, dental, sanitary napkins	**FG**	**Fishing Gear:** e.g. nets, bait, lures, hooks, buoys, floats, rope, fishing lines, traps
HP	**Household Products:** e.g. cleansers, shoes, textiles, bags, toys, crates, tarps, pens	**PM**	**Packing Materials:** e.g. boxes, Styrofoam (non-food), film, bubble wrap, delivery envelopes, tape
O	**Other / Unknown:** e.g. pellets, balloons, metals, fragments & pieces, tires, zip ties, papers		

†TYPE OF MATERIAL *(Circle one in the column above)*			
PET	**#1 plastic:** e.g. clear or tinted drink bottles, cups, or containers	**LDPE**	**#4 plastic:** e.g. trays, film, six-pack rings, snap on lids, wraps
HDPE	**#2 plastic:** e.g. hard & opaque bottles, milk jugs, polythene bags	**PP**	**#5 plastic** (polypropylene): e.g. food tubs, bottle caps & hinged lids, pill bottles
PVC	**#3 plastic:** e.g. pipes, shower curtains, toys	**PS**	**#6 plastic** (polystyrene): e.g. foam or hard plastic food containers, cups, lids
O	**Other / Unknown:** e.g. #7 plastic, paper, metals, or any material not caught above, including unknown or unidentifiable material		

^LAYERS *(Circle one in the column above)*		
	SL	single layer, e.g. clear flexible plastic film, wrappers, polythene bags
	ML	multi-layer, e.g. composites, laminates, sachets, packets, "Tetra Pak"

Submit your final data at:
www.breakfreefromplastic.org/brandaudittoolkit

TYPE OF PRODUCT

For every product that you find, try to identify one of the categories below to which it belongs. If the identity of the item is not immediately clear or if it doesn't neatly fit into a category below, you can mark it as 'Other' (that includes things like balloons, pellets, tires, pieces or fragments of larger items, various metal materials, etc.

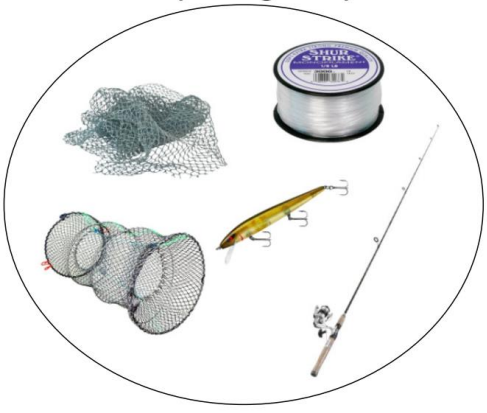
FP (Food Packaging)

HP (Household Products)

PC (Personal Care)

SM (Smoking Materials)

FG (Fishing Gear)



PM (Packing Material)

TYPE OF MATERIAL

If an item you collect in a clean-up has a visible plastic number on it, identify the plastic type using the handy guide below (PET, HDPE, PVC, LDPE, PP, or PS). Any product marked with a #7 or is not plastics or a type of material hard to identify—like sanitary products, diapers, or textiles - falls under the other category (O).

PET (1) Polyethylene terephthalate: Clear or tinted plastic; often used for drink bottles, cups, pouches, etc.

HDPE (2) High-density polyethylene: White or colored plastic; often used for product bottles, jars, milk jugs, etc.

PVC (3) Polyvinyl chloride: Durable plastic, hard or rubbery; often used for building materials, toys, shower curtains, etc.

LDPE (4) Low-density polyethylene: Clear, white, or colored plastic; often used for bags, plastic trays, holders, dispensers, etc.

PP (5) Polypropylene: Hard but flexible plastic; often used for food containers or tubs, bottle caps, etc.

PS (6) Polystyrene: Rigid, brittle plastic OR foam; often used for cups, take-out food containers, lids, etc.

O (7+) Other / unknown; bioplastics, products containing other plastics or types of materials, including textiles, etc.

MATERIAL LAYERS

Try your best to identify each product as single–layer (SM) or multi-layer (ML), based on your feel and perception of the material.

SL Single-layer, flexible plastic film; often used for packaging and wrapping, polythene bags, etc.

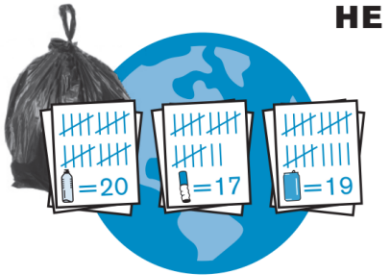
ML Multi-layer: plastic bonded with another material; often used for sachets, shelf-stable milk and juice boxes, personal care products, etc.

VOLUNTEER
OCEAN TRASH DATA FORM

Ocean Conservancy

Ocean and waterway trash ranks as one of the most serious pollution problems choking our planet. Far more than an eyesore, a rising tide of marine debris threatens human health, wildlife, communities and economies around the world. The ocean faces many challenges, but trash should not be one of them. Ocean trash is entirely preventable, and data you collect are part of the solution. The International Coastal Cleanup is the world's largest volunteer effort on behalf of ocean and waterway health.

HERE IS HOW IT WORKS:



1 CLEAN UP TRASH & COLLECT DATA

2 ORGANIZE & ANALYZE DATA

3 PUBLISH RESULTS

4 REDUCE OUR IMPACT

SITE INFORMATION:

Cleanup Site Name:

State or Province:

Zone or County:

Country:

Nearest Crossroad or Landmark:

NUMBER OF VOLUNTEERS WORKING ON THIS CARD:

adults

children (under 12)

MOST UNUSUAL ITEM COLLECTED:

TYPE OF CLEANUP:

Land: ☐ Underwater: ☐ Watercraft: ☐

Please return this form to your area coordinator.
If you are unable to do so, please mail or email it to:

Ocean Conservancy
Attn: International Coastal Cleanup
1300 19th Street, NW, 8th Floor
Washington, DC 20036
cleanup@oceanconservancy.org

Trash Free Seas: www.oceanconservancy.org/cleanup
Be a Green Boater: www.oceanconservancy.org/do-your-part/green-boating
Sponsors: www.oceanconservancy.org/cleanupsponsors

International COASTAL Cleanup

TRASH COLLECTED

Citizen scientist: Pick up all trash and record all items you find below. No matter how small the items, the data you collect are important for Trash Free Seas.®

EXAMPLE: TOTAL #

Plastic Bags: 𝍸 | = 8

Please DO NOT use words or check marks. Only **numbers** are useful data.

MOST LIKELY TO FIND ITEMS:

TOTAL #

Cigarette Butts: =

Food Wrappers (candy, chips, etc.): =

Take Out/Away Containers (Plastic): =

Take Out/Away Containers (Foam): =

Bottle Caps (Plastic) =

Bottle Caps (Metal) =

Lids (Plastic) : =

Straws/Stirrers: =

Forks, Knives, Spoons: =

Beverage Bottles (Plastic): =

Beverage Bottles (Glass): =

Beverage Cans: =

Grocery Bags (Plastic): =

Other Plastic Bags: =

Paper Bags: =

Cups & Plates (Paper): =

Cups & Plates (Plastic): =

Cups & Plates (Foam): =

FISHING GEAR:

TOTAL #

Fishing Buoys, Pots & Traps: =

Fishing Net & Pieces: =

Fishing Line (1 yard/meter = 1 piece): =

Rope (1 yard/meter = 1 piece): =

PACKAGING MATERIALS:

TOTAL #

6-Pack Holders =

Other Plastic/Foam Packaging: =

Other Plastic Bottles (oil, bleach, etc.): =

Strapping Bands: =

Tobacco Packaging/Wrap: =

OTHER TRASH:

TOTAL #

Appliances (refrigerators, washers, etc.): =

Balloons: =

Cigar Tips: =

Cigarette Lighters: =

Construction Materials: =

Fireworks: =

Tires: =

PERSONAL HYGIENE:

TOTAL #

Condoms: =

Diapers: =

Syringes: =

Tampons/Tampon Applicators: =

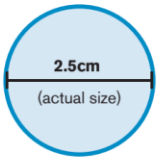
TINY TRASH LESS THAN 2.5CM:

TOTAL #

Foam Pieces =

Glass Pieces =

Plastic Pieces =



DEAD/INJURED ANIMAL	STATUS	ENTANGLED	TYPE OF ENTANGLEMENT ITEM
	Dead or Injured	Yes or No	

ITEMS OF LOCAL CONCERN:

1. 2. 3.

CLEANUP SUMMARY (circle units)

Number of Trash Bags Filled: | Weight of Trash Collected: lbs/kgs | Distance Cleaned: miles/km