



Report on GA T1 – Database, Activity A.T.1.1 - Data provision on waterflows and waste flows in targeted Black sea areas in Georgia

Research has been carried by Scientific/Research Firm “Gamma Consulting Ltd” contracted (Contract # 1362/06, 21.12.18) by Iv. Javakhishvili Tbilisi State University (TSU) – Pr.3 as external service within Black Sea Basin ENI CBC 2014 - 2020 BSB552 project “Innovative techniques and methods for reducing the marine litter in the Black Sea coastal areas – RedMarLitter”

2019

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Introduction

Marine litter is included in the Marine Strategy Framework Directive (MSFD European Commission, 2008) as one of the Descriptors –particularly Descriptor 10, for determination of marine environmental status. To develop effective strategies for the establishment of survey programs that aim to reduce plastic litter and its possible impacts, it is necessary to identify and quantify the litter found and their pathways to the marine environment.

Due to the nature of litter, its spatial and temporal variability, the multitude of items, etc., precise data on the flux of litter cannot be obtained. Marine strategy consider collection, reporting and assessment of data on marine litter, in particular beach litter, floating litter, seafloor litter, litter in biota and microlitter.

Monitoring of litter on the coastal area should provide amount and character of litter pollution and provide comparable information for national and regional assessments of marine litter.

The composition of litter is one of the important positions of coastal assessments. A detailed assessment of litter composition on the beaches provides information on potential sources of the litter found, and help to assess the harm to the environment.

Riverine litter can be identified as litter present in rivers and on riverbanks. The rivers can be considered as pathways which collect litter from run-off and direct input, transporting it towards the marine environment. Litter may also remain in the river catchment, to possibly be released at a later date in its entirety or after physical degradation.

Potential sources of litter in sea environment can represents public littering on riverbanks or directly in the river, also waste from cities and harbors; poor waste management practices such as poorly managed landfill sites, improper disposal or loss of products from industrial and agricultural activities; debris from the discharge of untreated sewage, either through lack of waste-treatment facilities, from sewer overflows; and storm water discharges, which also sweeps litter collected in storm drains into the rivers.

Riverine litter input is estimated as a major contributor to marine litter, but there is no comprehensive information about the amount of litter being transported through rivers to the sea. Furthermore, there are no harmonized methodologies for providing quantitative data for comparable assessments of riverine litter.

Research on collection of data for execution of the tasks of T1 – Database of the BSB552 Project “RedMarLitter” have been carried using all available sources, including results of international projects (in particular, “EMBLAS II’ and “EMBLAS Plus”, financed by the European Union and implemented by UNDP through the Black Sea Synergy - a regional cooperation initiative, that highly encourages cooperation with the projects funded under the Call fo proposals of JOP Black Sea Basin 2014-2020), national monitoring programme and expeditions held by Scientific/Research Firm “Gamma Consulting Ltd” and Iv. Javakhishvili Tbilisi State University.

Litter monitoring on the Georgian sea area

The problem of pollution of the coastal areas with solid waste has essentially become aggravated in Georgia in recent years. In Georgia the investigations concerning marine litter was not carried out. Therefore, there is no methodology, experience or any research material with regard to this category of pollution. With consideration of the relevance of the problem for the Georgian coastal zone, the research program was developed to eliminate existing gaps. The research concerning marine litter was started in 2015. Research program included the development of litter monitoring methods and operational protocols for beaches, rivers and sea surfaces and adaptation of litter item's "Master List".

For conduct of monitoring sessions, the monitoring sites were select. The selection was based on the recreational, social and other value of sites, on the consideration of potential sources of impact, exposure of visitors etc.

Survey Methods

Beach Litter Monitoring

A sampling unit is defined as a fixed section of a beach covering the whole area from the strandline to the back of the beach. Within the monitoring of beaches of Georgian coastal area, one sampling unit on each sampling site was selected: 50-metres stretch from the strandline to the beck of beach. The same sites should be monitored for all surveys in future, as well. In order to identify the start and end points of each sampling unit permanent reference points can be used with coordinates obtained by GPS and, also, fixed by visual reapars.

Before any sampling session, shoreline characterization was conducted for each 50 m site. The site's special characteristics, including the type of substrate (sand, pebbles, etc.), beach topography, beach usage, distances from urban settlements, shipping lanes, river mouths, essential harbors, wastewater discharges etc. were recorded. Great quantity of photos was taken to document the physical characteristics of the monitoring site.

The sampling signify collection and identification of founded litter item units. All items founded, its quantity was recorded in the 'Beach Litter Monitoring Sheet'. Litter items categories are included in Master List of litter items. Each type of items have a unique identification number, identified by MSFD Technical Subgroup on Marine Litter and Oslo-Paris convention (Guidance on Monitoring of Marine Litter in European Seas, 2013). For facilitation of Identification and correct categorization of litter items may be used the Photo Guide, elaborated by TSU scientific staff.

River Floating Litter Monitoring

Counting and classification of litter items in rivers was based on the Riverine Litter Observation Network (RiLON) activities, which collected data from rivers in the European marine basins over a period of one year (September 2016 – September 2017). Data was collected by visual observations and documented with the JRC Floating Litter Monitoring Application for mobile devices, allowing a harmonized reporting, compatible with the MSFD Master List of Categories for Litter Items.

For survey are selected 4 essential rivers. The data are received by visual observation sessions during 1 hour, from bridges, existing close the river mouths. The hight of the bridges from the river surface permit to identify litter > 2.5 cm size, across the width of the river. Observers were using the Litter Monitoring Apps,

documented only floated litter or suspended in the river surface layer. The litter item categorization was elaborated on the base of MSFD Master List of Categories of Litter Items. Consequently, the use of a common list allowed a harmonized data processing and analysis, facilitating the ranking of the most frequent litter items observed by the RiLON.

Characterization of Survey sites

Beach litter survey

The beaches in terms of litter monitoring were selected according to the following considerations:

Ureki is a famous resort, which has specific customers. The resort is densely populated during the summer season. Due to its healing and recreational benefits, usually children make up the majority of visitors. In last years, nowadays intensity of construction works and infrastructure development is notably increased in Ureki, namely in Shekviteli zone. The northern part of Ureki borders Riv. Tskaltsminda and Riv. Supsa mouths. The potential source of pollution is the river on the one hand, and densely built-up town, on the other hand.

The second selected survey site is located between Kobuleti and Shekviteli, exactly 2km to north from northern edge of Kobuleti. This zone unlike center Kobuleti has relatively low level of human activity. There are no private houses, touristic or recreational infrastructure, trade counters or domestic waste water. There is no visible source of waste and the river mouth is quite far away from this beach. The area adjacent to the beach is not populated. The nearest source of pollution with solid waste is not observed. Taking all these facts into consideration, it can be stated that this part of Georgian beach can be used for the identification of background data.

3rd survey site is located in Sarpi, along with the international East-West highway E60, which is located 200 m away from the gate of Georgian-Turkey state land border. The highway goes over the concrete wall, which is located on the backside of the beach. On the opposite side of the highway, there are private houses, hotels and cafes. Wastewater from this settled place runs directly on beach. One part of the beach is under the works, aiming to protect the coastal zone from erosion.

Sarpi beach is very busy during summer season. On the sea shore hotels and guesthouses are operating. The highway is permanently overcharged with cars and transit vehicles. Due to high traffic on Georgian and Turkish crossing border, these vehicle are stuck for a couple of days. There are a lot of cafés, fast food facilities and counters for the souvenirs around the place. Therefore, this place is under the high pressure of human activity.

In frame of EMBLAS Plus 2 monitoring sites were added: the fourth site situates close to the Riv. Tskaltsminda mouth. This section represents the northern end of Ureki beach, is rarely visited, and therefore, cleaning measures were not made.

The 5th monitoring site situates on southern periphery of Poti, near the Riv. Maltakva mouth. Maltakva beach spreads over 3km, in some places the width of beach reaches 170 m. The beach is under maintenance and seasonally is visited. Monitored section situated on the northern part.

According to the methodology, 50 m long sampling units have been marked on each selected beach. Marginal spots have been marked with flag-markers. The exact locations on the map were fixed by GPS. Visible landmarks have been also recorded. The pilot program included research of macro-litter - 2.5 cm large waste. All items in this size category were collected, identified according to the "Master List", recorded and filled in proper forms.

Sampling sites information is given in Annex 1.

Results of Beach Litter Monitoring

2015

In 2015, beach litter survey was carried out on 2 sites: Ureki and Kobuleti.

Initial visual assessment of study beaches revealed that both study areas are full of unprocessed, natural wood debris. It should be noted that the wood debris are collected and withdrawn from the beach by the local population, using them for heating purposes.

Table 1. The density of litter on two sites by the essential categories

Litter categories	Ureki 50m	%	Kobuleti North Perif. 50m	%
Plastic	1497	94.45	851	96.27
Rubber	5	0.32	1	0.11
Textil	26	1.64	8	0.90
Processed/worked wood	12	0.76	1	0.11
paper/ Cardboard	11	0.69	3	0.34
Metal	21	1.32	10	1.13
Glass/ceramics	11	0.69	7	0.79
Other	2	0.13	3	0.34
TOTAL	1585	100	884	100

The obtained results show, that the percentage distribution of the different categories of litter is similar for both beaches. The volume of plastic litter is 95 – 96%, footwear and textile remains are a bit more than 1% (1,64 – 1,13% respectively), the volume of other types of litter is less than 1% (Table 1).

Among the constituent elements of the plastic litter, the bottle caps take the major share - 30% and more. The volume of different sizes plastic bottles is 10%. A large volume of different-sized pieces of plastic litter are also marked - 20% (Fig.1).

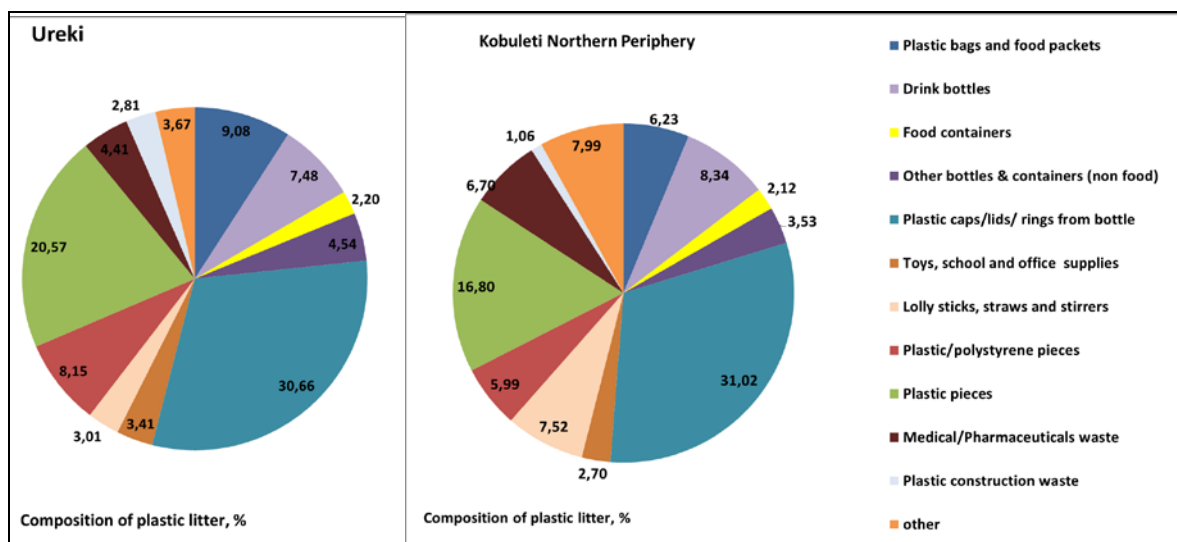


Fig. 1. Composition of plastic litter

It should be noted that the volume of medical and pharmaceutical litter is quite high within the study section, including medication vials, ampoules, syringes and needles; transfusion system was discovered as well. For 50 m long section their density is 63 units on Ureki beach, while on Kobuleti beach - 57. Based on this, we suppose that hazardous waste is not properly managed within the study region and that they are dumped together with municipal waste (Fig. 2).



Fig. 2. Medical waste on the Kobuleti (left) and Ureki (right) beaches.

According to the initial results, we can conclude that the litter on the surveyed sections of beaches is generated from land-based sources. They do not contain elements that could occur in the sea from ships, or could be related to fishing. Solid waste, including wood litter is transported by rivers into the sea. This explains the layout of litter like strips along the entire length of the beach, and the relatively clean and contaminated zones alternation.

Results of Beach Litter Monitoring

Common borders. Common Solutions

2016

In 2016, beach litter survey was carried out on 2 sites: Sarpi and Kobuleti.

The results of the survey showed that the total amount of waste on Kobuleti beach twice exceeded amount of waste on Sarpi beach (1560 and 844 units respectively, Table 2). There was a large amount of plastic waste especially in Kobuleti (1422 unit, 91.15% of total), meanwhile the level of plastic waste on Sarpi beach was much lower (516 unit, 61.14% of total).

Based on the results of the survey it can be concluded, that the highway represents the main source of waste on Sarpi beach due to the permanent traffic jam on the border. This waste mainly consists from food and food containers, cans and sweet/crisp wrappers, drink bottles, as well as spoiled car parts. It is obvious, that all these waste gets to the beach from the road and not from the sea side. This part of Georgian beach was selected with the aim of identification of trends of trans-boundary impact of litter. The survey did not show us expected impact. Accordingly, road transport and municipal infrastructure represents the main source of this beach litter.

Table 2. Content of core categories of litter for Sarpi and Kobuleti Northern Periphery beaches

Beach Litter Categories	Kobuleti N.P., 50 m	%	Sarpi, 50 m	%
Plastic	1422	91,15	516	61,14
Rubber	30	1,92	43	5,09
Clothing (clothes, shoes)	52	3,33	28	3,32
Paper/Cardboard	0	0,00	13	1,54
Processed/worked wood	8	0,51	12	1,42
Metal	18	1,15	153	18,13
Glass/ceramics	6	0,38	49	5,81
Other/	24	1,54	30	3,55
Total	1560	100	844	100

Results given from the research made it clear that the waste on the sampling sites appeared from the land based sources, leached from the sea or left on the beach by visitors. On Kobuleti beach there was found waste related to the fishing stuff, these were handmade fishing float, rope and remains of nets (Fig. 3).

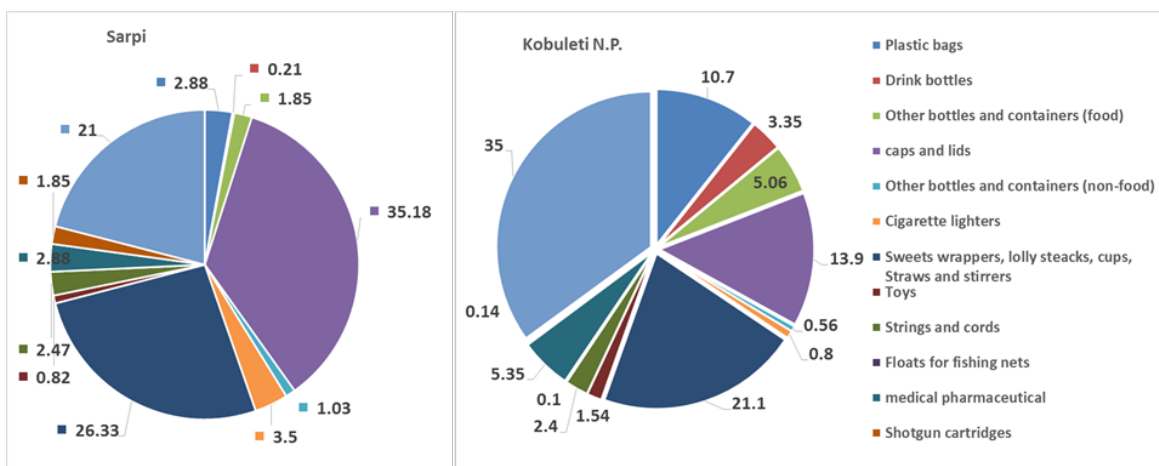


Fig. 3. Composition of beach plastic litter

Content of plastic litter show that mostly presented on the beaches are plastic bottles and caps. In addition, it is evident that medical and pharmaceutical items in small quantities still occur (16 and 14 units).



Fig. 4. Handmade fishing net float



Fig. 5. Shoes (leather and rubber)



Fig. 6. Metal



Fig. 7. Ropes and cords



Fig. 8. Tire

Results of Beach Litter Monitoring

2017

In 2017, beach litter survey was carried out in April, on 2 sites: Kobuleti and Sarpi.

The amount and percentage of main categories of beach litter on the studied area are given in table 3.

Table 3. Content of main categories of beach litter

Litter categories	Sarpi, 50 m		Kobuleti northern periphery 50 m	
	Item density	%	Item density	%
Plastic	43	86	386	91.5
Rubber	1	2	8	1.9
Textil	-	-	12	2.8
Metal	5	10	6	1.4
Glass	1	2	10	2.4
TOTAL	50	100	422	100

This monitoring session coincided with storm season, and relatively low loading of litter on the beaches was evident. Metal and pharmaceutical waste occurred on Kobuleti beach (10 units, 2.6% of total plastics).

On Sarpi beach was observed relatively low content of plastic, due to specific anthropogenic impact, characteristic for this sector. Metal and pharmaceutical waste was not observed.

Results of Beach Litter Monitoring

2018

In 2018, beach litter survey was carried out on 3 sites: Ureki, Kobuleti and Sarpi.

The amount and percentage of main categories of beach litter on the three studied areas are given in table 4.

Table 4. Content of main categories of beach litter

Litter categories	Sarpi, 50 m		Kobuleti northern periphery 50 m		Ureki 50 m	
	Item density	%	Item density	%	Item density	%
Plastic	165	79.71	941	95.05	114	100
Rubber	12	5.80	18	1.82	0	0.00
Metal	30	14.49	26	2.63	0	0.00

Glass	0	0.00	5	0.51	0	0.00
TOTAL	207	100	990	100	114	100

This monitoring is produced in summer holiday season when local municipal daily cleaning measures take place. Because of this, on Ureki beach the lower amount of waste (114 units) was observed, fully consisted from plastic.



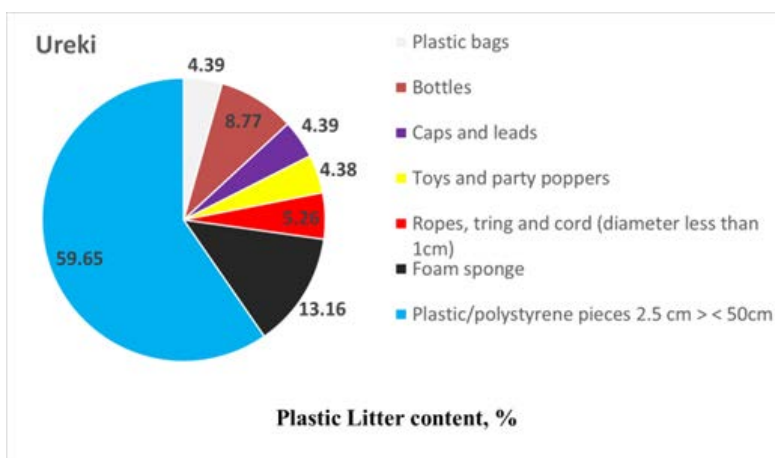
Fig. 9, 10. Ureki beach

On Ureki beach there is a large amount of wood debris, leached by sea waves (Fig. 9).

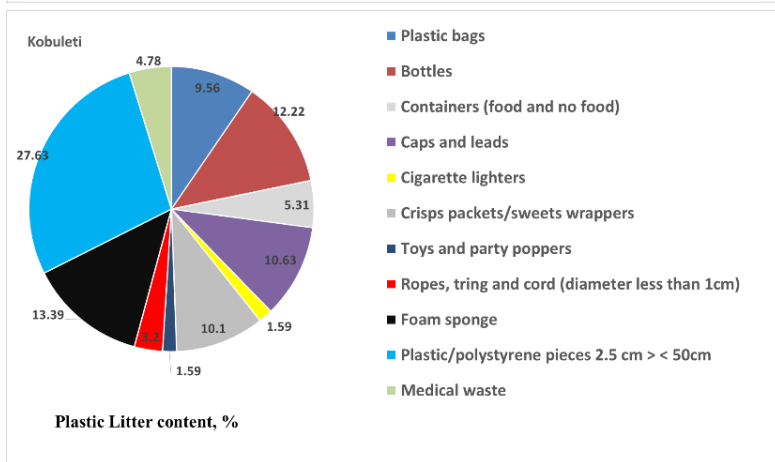
Compare with Ureki, the Sarpi beach is under hard stress originated from its location - the trans-boundary highway, which is highly busy with freight transportation, situated very close to the beach.

Kobuleti Northern Periphery beach is not popular in visitors and properly cleaning service is quite poor in this area, that is why this area can be considered as background area. According the results getting in previous years as well as last year can be concluded that litter density in 100 m length of beach attains about 2000 items, from which 91 -96% plastic presents.

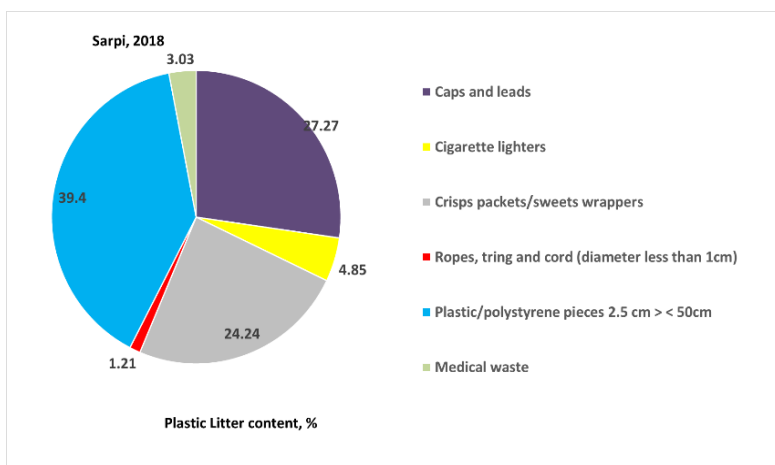
Plastic litter mainly consists from different sizes (2.5 – 50 cm) of plastic polystyrene pieces, drink bottles and caps (Fig. 6, 7, 8). It should be mentioned, that the medical waste is, also, fixed, mainly presented by a medical/pharmaceuticals containers, pallets and tubes, syringes and needles.



a



b



c

Fig. 11 (a, b, c). Composition of plastic litter



Fig. 12. Beach of Ureki

Results of Beach Litter Monitoring

2019

In 2019, beach litter survey was carried out on 5 sites: Ureki, Kobuleti, Sarpi, Tskaltsminda and Maltakva, from 31 August to 9 September.

The amount and percentage of main categories of beach litter on the five studied areas is given in table 5.

Table 5. Content of main categories of beach litter

Litter categories	Tskaltsminda 25 m		Sarpi 50 m		Maltakva 50 m		Kobuleti N.P. 50 m		Ureku 50 m	
	Item density	%	Item density	%	Item density	%	Item density	%	Item density	%
Plastic	549	95.64	97	68.79	452	93.00	592	90.80	345	89.61
Rubber	1	0.17	9	6.38	5	1.03	4	0.61	1	0.26
Textile	-	-	-	-	2	0.41	3	0.46	6	1.56
Paper	-	-	8	5.67	8	1.65	33	5.06	14	3.64
Processed wood	4	0.70	2	1.42	2	0.41	0	0.00	4	1.04
Metal	11	1.92	19	13.48	9	1.85	10	1.53	1	0.26
Glass	9	1.57	6	4.26	8	1.65	10	1.53	14	3.64
TOTAL	574	100	141	100	486	100	652	100	385	100

The survey was conducted on 50 m long monitoring sites, except Tskaltsminda, everywhere the large amount of litter was observed.

This monitoring session coincided with the summer season. The local municipal bodies held the beach cleaning activities every morning, at popular visited beaches. To this kind of beaches belong Sarpi and Ureki. The other monitoring sites (Tskaltsminda, Maltakva, Kobuleti N.P.) are not exposed to daily cleaning, and, correspondingly, the amount and categories of litter differs for two different managed beaches.

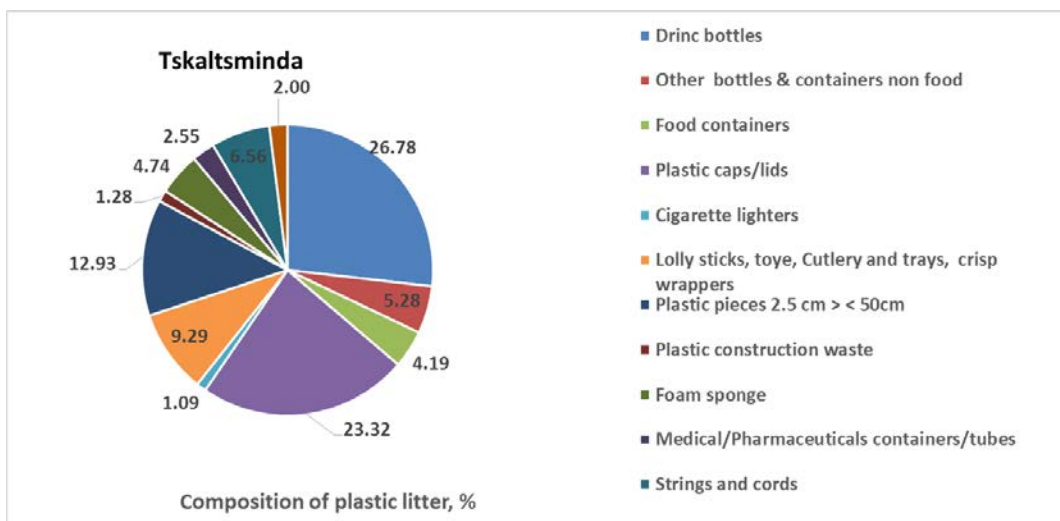


Fig. 13a, b. Beach monitoring session Tskaltsminda

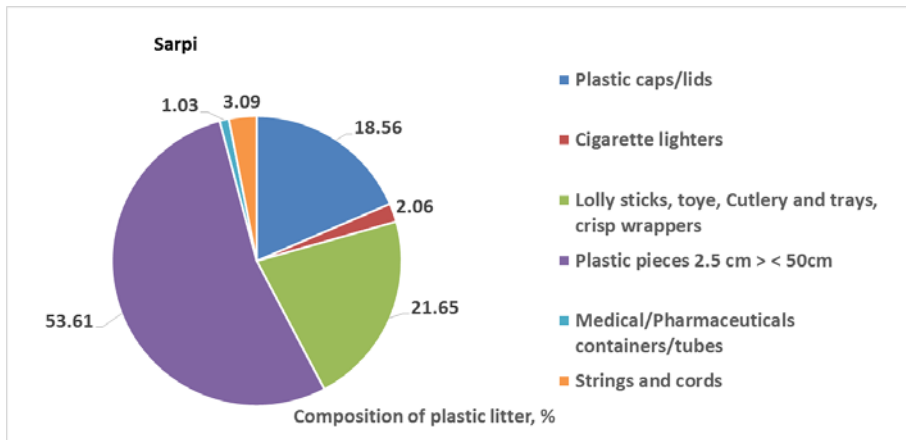


Fig. 14 a, b. Beach monitoring session Maltakva and Ureki

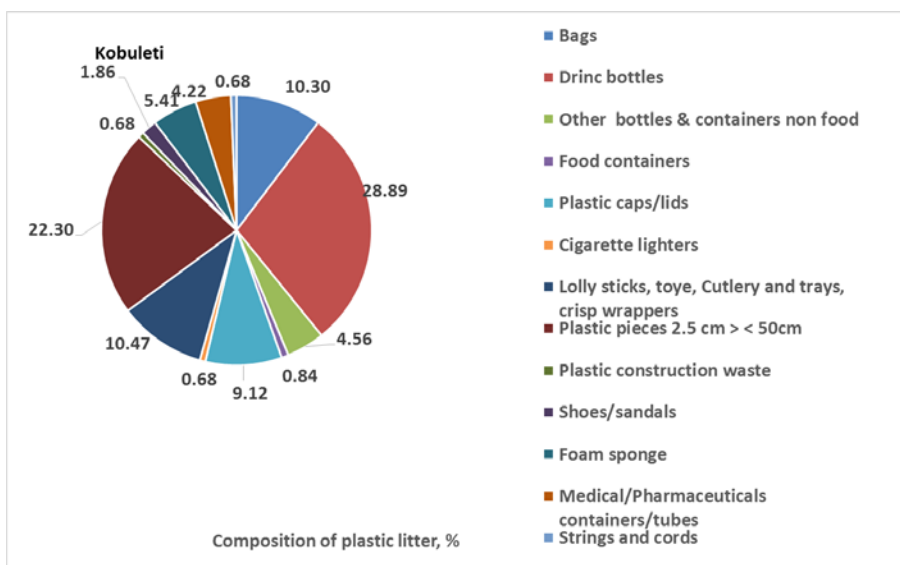
Ureki is the most populated among the studied sites, therefore, daily impact of litter is more than on other sites. The lowest loading of litter is received on Sarpi beach (Table 6). This site is characterized with relatively high concentration of metal items, and, respectively, lowest percentage of plastic. Composition of plastic litter is given on Fig. 15 a, b, c, d, e .



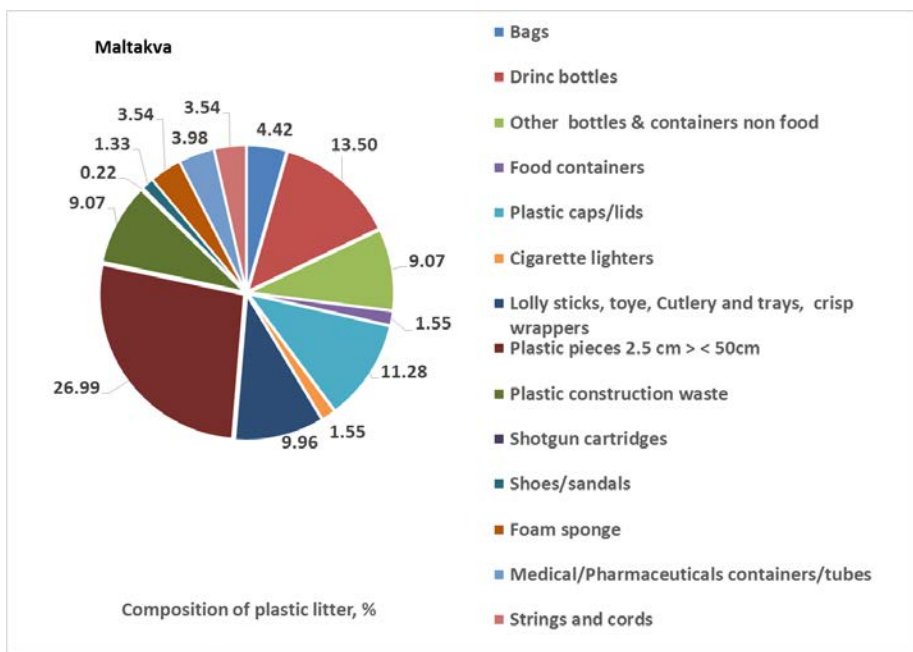
a



b



c



d

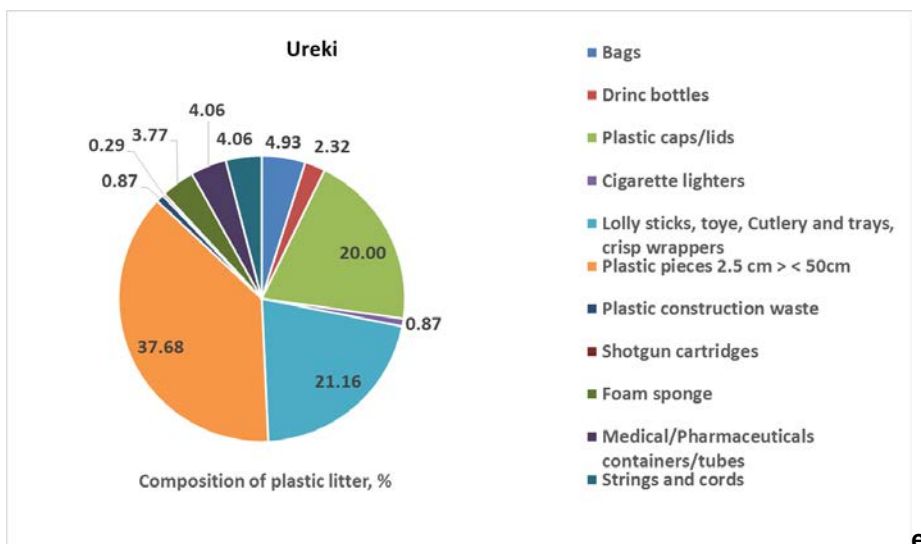


Fig. 15 a, b, c, d, e. Composition of beach plastic litter

The main part of plastic litter composed by drinking bottles, caps/lids and different size of plastic pieces. It should be noted that a large amount of medical/pharmaceutical waste is observed, in particular, the number of items of this category varies from 1 to 36 (up to 7% of total plastic).

As noted above, Kobuleti Northern Periphery (Kobuleti N.P.) beach is considered as background area. Based on 4 years of monitoring it can be concluded, that average load of litter on the beach is 900 items, 91-96% of them composed by plastic. On this site the main part of litter is leached from the sea. On Ureki and Sarpi beaches the certain part of waste is left by visitors, but ecological impact on this sites has different characters. The seasonal variations are evident, after summer holiday season the waste amount increase.

Table 6. Litter concentration and percentage

	Kobuleti N.P.	% of plastic	Sarpi	% of plastic	Ureki	% of plastic
2015.10	884	96.27	-	-	1585	94.45
2016.10	1560	91,15	844	61,14	-	
2017.04	422	91.5	50	86	-	
2018.09	990	95.05	207	79.71	114	100
2019.09	652	90.80	141	68.79	385	89.61

Results of Riverine Floating Litter Monitoring

In 2016-2017 three riverine floating monitoring sessions were carried out within the frames of international projects. For registration and categorization of floating litter JRC Floating Litter Monitoring Application is used. Mentioned device really facilitates the procedure of monitoring. It gives the possibility to record coordinates and time *in situ*. In additional, application allows register floating items named “non litter”, e.g. wood, leaves, feathers etc., which is occurred on the river surface and compose important part of material leached on the beaches from the sea.

In November 2016, the plastic litter density on the surface of rivers varies from 9 (Riv. Chorokhi) to 67 (Riv. Supsa). The greatest amount of non-litter items – 334 – is observed on surface of Riv. Natanebi (Table 7). It should be noted the relatively high quantity of plastic bags and bottles in Riv. Supsa. The existence of “Litter Patch” is characteristic for this river.

Table 7. Riverine floating litter. 2016 October monitoring session

Type and name of the waste	Code of the waste (internal for the project) *	Riv. Natanebi Date: 16.10.2016 Time 16:51-17:51		Riv. Chorokhi Date: 15.10.2016 Time: 16:12-17:12		Riv. Rioni Date: 20.10.2016 Time: 16:53-17:53		Supsa Date: 16.10.2016 Time: 13:27-14:27	
		Size categories, cm							
		2,5 -50	>50	2,5 -50	>50	2,5 -50	>50	2,5 -50	>50
Plastic bags	G2	6		1		4		10	
Plastic bottles	G6	8				1		19	
Food containers, incl. fast food (milk buckets, cans, etc.)	G10	5		1		3		6	
Cover / packaging;	G38					2			
Ropes, Strings and cords	G50	1						1	
Sheets	G67			2					
Foam	G74							1	
Plastic pieces 2.5cm - 50cm	G79	5		1		1		3	
Other rubber pieces	G134			2				4	
Paper packaging	G149	13		1		1		4	
Processed wood	G160							7	
Litter Patch >20 items		5		1				12	
NON-LITTER									
Other wood		186		76	7	49	1	75	2
Leaves		148		40		30		14	
Feathers				3		17		3	
TOTAL LITTER		43		9		12		67	

TOTAL NON LITTER		334		126		97		94	
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In April 2017 monitoring session, during 1-hour observation, appears, that plastic litter amount reached not 38 units. "Non litter" quantity varies into 51-106 units (Table 8).

Table 8. Riverine floating litter. 2017 April monitoring session

Type and name of the waste	Code of the waste (internal for the project) *	Riv. Chorokhi Date: 22.07.2017 Time: 14:12 - 15:12		Riv. Natanebi Date: 21.04.2017 Time: 12:48-13:48		Riv. Rioni Date: 23.04.2017 Time: 11:57-12:57		Supsa Date: 21.04.2017 Time: 11:17-12:017	
		Size categories, cm							
		2,5 - 50	>50	2,5 - 50	>50	2,5 -50	>50	2,5 -50	>50
Plastic bags	G2	1		3					
Plastic bottles, vials	G6	5				2		2	
Food containers, incl. fast food (milk buckets, cans, etc.)	G10	1		3		2			
Cover/packiging	G38	6		24		2		1	
Plastic pieces 2.5cm - 50cm	G79	6		7		1		9	
Other rubber pieces	G134	3							
Paper packaging	G149			1		1			
NON-LITTER									
Other wood		75	3	58	1	36	15	1	
Leaves		4		44				51	
Feathers		1		2					
Dead fish				1					
TOTAL LITTER		22		38		8		12	
TOTAL NON LITTER		83		106		51		52	

In April 2017 monitoring session, during 1-hour observation, appears, that plastic litter amount reached not 38 units. "Non litter" quantity varies into 51-106 units (Table 8).

Table 9. Riverine floating litter. 2017 June-July monitoring session

Type and name of	Code of the waste	Riv. Chorokhi, Date: 2017.07.04 Time:	Riv. Supsa, Date: 2017.06.27 Time:	Riv. Rioni, Date: 2017.06.28 Time:	Riv. Natanebi Date: 2017.06.27 Time:
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		12:56 -13:56		11:48-12:48		12:11-13:11		17:08-18:08	
		Size categories, cm							
		2,5-50	>50	2,5-50	>50	2,5-5	>50		
Plastic bags	G2	4				6			
Plastic bottles, vials	G6	11		1		10			
Food containers, incl. fast food (milk buckets, cans, etc.)	G10	17		2		23			
Cover / packaging	G38			2		1		2	
Foam	G74	3				1			
Plastic pieces 2.5cm - 50cm	G79	3		5		5			
Other rubber pieces	G134	1				4			
Paper packaging	G149	1		2					
Pallets	G160	1				2			
Litter patch >20 items				2					
NON-LITTER									
Other wood		65	9	37	6	102	10	71	1
Leaves		9		11		13		79	
Feathers		12						2	
Total Number of Litter		41		14		52		2	
Total Number of Non Litter		95		54		125		153	

The June-July monitoring session (Table 9) shows the moderate amount of litter (2 – 52 units) and non-litter (51 – 106 units).

Table 10. Riverine floating litter. 2017 November monitoring session

Type and name of the waste	Code of the waste	Riv. Chorokhi, Date: 2017.11.07 Time: 11:21-12:21		Riv. Supsa, Date: 2017.11.10 Time: 13:12-14:12		Riv. Natanebi, Date: 2017.11.10 Time: 14:51-15-51		Riv. Rioni, Date: 2017.11.09 Time: 12:41-13:41	
		Size categories, cm							
		2.5-50	>50	2.5- 50	>50	2.5-50	>50	2.5- 50	>50
Plastic bags	G2	2				1		3	
Plastic bottles, vials	G6			1		1		1	
Food containers, incl. fast food (milk buckets, cans, etc.)	G10							1	
Cover / packaging	G38	2		6		11		4	
Gloves	G39							2	
Plastic pieces 2.5cm - 50cm	G79	2				1		2	
Litter patch >20 items								7	
NON-LITTER									

Other wood		22	1	12	2	23		1	
Leaves		7		18		142		11	
Feathers				6		2		15	
Total Number of Litter		6		7		14		20	
Total Number of Non Litter		30		38		167		27	

The session of November 2017 show that in all rivers plastic litter amount not exceeds 20 units. Increased amount of “Non Litter” is observed in Riv. Natanebi – 167 units (Table 10).



Fig. 16 a, b. Riverine floating litter

Table 11. Riverine floating litter. 2019 August-September monitoring session

Type and name of the waste	Code of the waste (internal for the project) *	Riv. Natanebi Date: 02.09.2019 Time: 09:42-10:42		Riv. Chorokhi Date: 01.09.2019 Time: 11:52 - 12:52;		Riv. Rioni Date: 2019.08.31 Time: 12:19-13:19		Riv. Supsa Date: 31.08.2019 Time: 15:28-16:28	
		Size categories, cm							
		2,5 - 50	>50	2,5 -50	>50	2,5 -50	>50	2,5 -50	>50
Plastic bags	G2							7	
Plastic bottle	G6	1		1		2		5	
Food containers, incl. fast food (milk buckets, home-made cans, etc.)	G10	2						2	
Cover / packaging	G38	3				2		17	
Plastic pieces 2.5cm - 50cm	G79	4				2		5	

Paper packaging	G149	4				1		2	
NON-LITTER									
Other wood		38		2		32		171	5
Leaves		128		5		19		57	
Feathers		2		9		7		8	
Total litter		14		1		7		38	
total non-litter		168		16		58		241	

The marine litter monitoring session was carried out from the end of August to September of 2019. First session showed the relatively low amount of the litter (Table 11).

Conclusion (Riverine floating litter)

In conclusion, it should be noted, that, in the average 200 – 400 unit of plastic per hour, can be transported by 4 essential rivers into the sea area. Most commonly plastic bottles and bags are occurred, paper and rubber items are rare.

Concerning “Non Litter” units (wood, leaves, feathers), in all examined rivers, its amount, exceeds amount of plastic litter, varies in large scale, and may reach in total 1000-1200 unit per hour for all examined rivers.



Fig 17. Riverine litter survey



Fig. 17 a, b. Survey vessels
a- Vessel of Batumi State Maritime Academy
b- Vessel of State Hydrographic Service of Georgia



Fig. 18. Sea survey session. Batumi transect



Fig. 19. Sea survey session. Poti - Kulevi transect

Results of Sea Floating Litter Monitoring

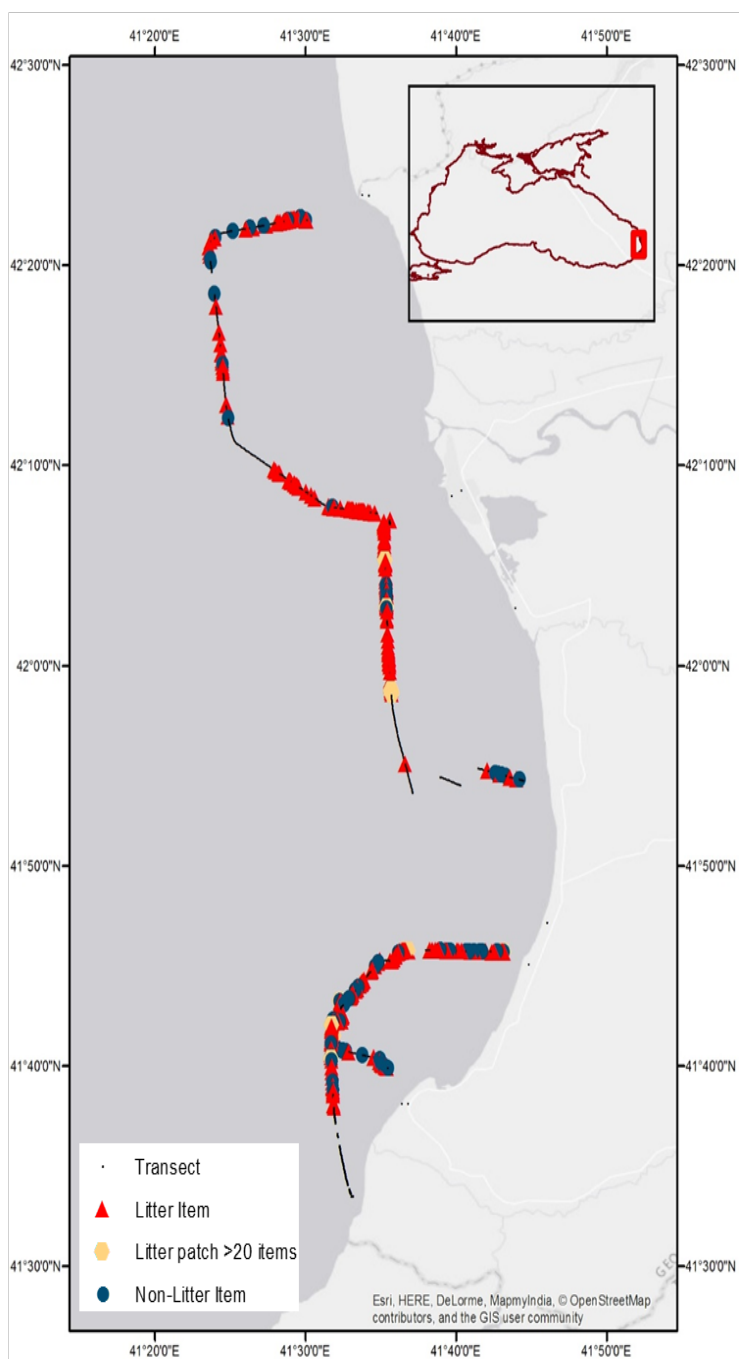
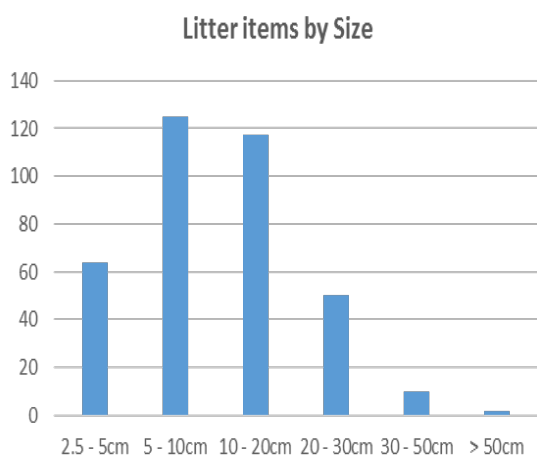
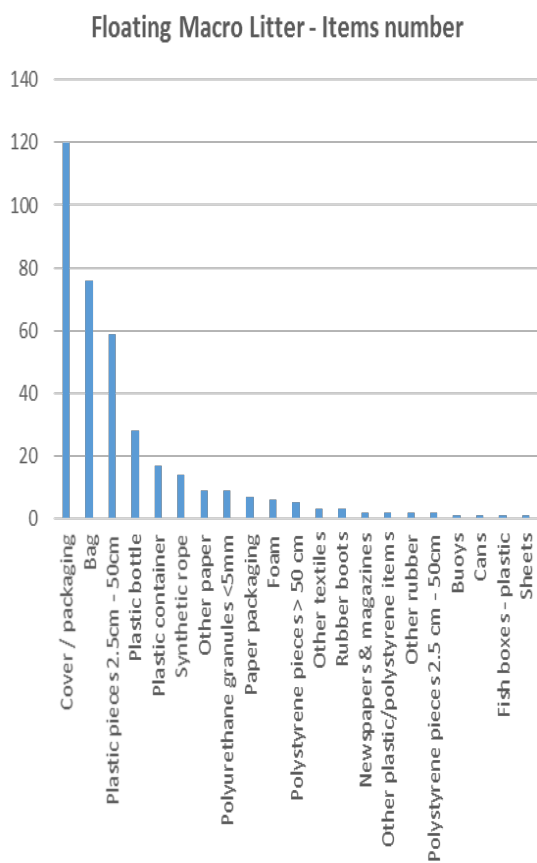
Survey of litter on sea surface was carried out during the National Pilot Monitoring Survey 25-30 May 2016. The data recorded by mobile app was processed by EEA database RIMMEL.

A total of 20 monitoring transects was covered during survey Georgia NPMS (28-31 May 2016), corresponding approximately to a combined length of 114 kilometres for all transects, with an observation track width of 10 metres, covering 1.14 square kilometres of observation surface. A total of 368 Litter items was observed, which accounts for an average concentration of **322 Litter items per square kilometre**.

Table 12. Floating Marine Macro Litter - data. NPMS GE (28-31 May 2016).

Litter Items	Size categories						Total by Items
	2.5 – 5 cm	5 – 10 cm	10 - 20 cm	20 – 30 cm	30 – 50 cm	> 50cm	
Cover / packaging	27	47	34	12			120
Bag	8	17	30	18	3		76
Plastic pieces 2.5cm - 50cm	15	27	13	2	1	1	59
Plastic bottle	1	5	17	5			28
Plastic container	1	2	7	6	1		17
Synthetic rope	1	7	3	2	1		14
Other paper	1	5	2		1		9
Polyurethane granules <5mm	5	4					9
Paper packaging	1	3	3				7
Foam	1	4	1				6
Polystyrene pieces > 50 cm	1	1		1	2		5
Other textiles		1	1			1	3
Rubber boots			1	2			3
Newspapers & magazines			1	1			2
Other plastic/polystyrene items	2						2
Other rubber		1			1		2
Polystyrene pieces 2.5 cm - 50cm			1	1			2
Buoys		1					1
Cans			1				1
Fish boxes - plastic			1				1
Sheets			1				1
Total by size	64	125	117	50	10	2	368
Litter patch >20 items	2	3	10				15

Non-Litter items	Size (cm)						Total by Items
	2.5 – 5	5 – 10	10 – 20	20 – 30	30 – 50	> 50	
Feathers	1	5					6
Leaves	1	4	1				6
Other wood	7	20	20	13	7	3	70
Total by size	11	32	31	13	7	3	82



Common borders. Common Solutions

Fig.20. Floating Marine Macro Litter - bar graphs and map. NPMS GE(28-31 May 2016)

On transect Batumi – Chakvi and Kobuleti – Tsikhisdziri it was observed practically clean sea surface, without litter and vegetable debris.

On transect Poti – Kulevi we have observed large amount of plastic bottles and polystyrene pieces. This waste was occurred into the sea area from container ships, standing on long-distance raid, 400 – 500m from coastline.





Common borders. Common Solutions

ANNEX 1

Information on survey sites

Beach sampling sites

Name of beach: Sarpi

Country: Georgia

Beach width at mean low spring tide: 68 m

Total length of beach: 800 m

GPS coordinates, start 50m:

1) 41.522318°N ; 41.548278°E; 2) 41.522764°N; 41.548371°E;

3) 41.522902°N; 41.547649°E; 4) 41.522451°N; 41.547503°E

Coordinate system used: Decimal degrees

Date position measured: 18/10/2016 (d/m/y)

Prevailing currents of the beach: N -W

Prevailing winds*: N - W

Type of beach material (% coverage): Pebbles – 70%, sand -30%

Beach topography: slope 7.4%

Are there any objects in the sea (e.g. a pier) that influence the currents: No

Major beach usage (local people, swimming and sunbathing, fishing, surfing, sailing etc):

Local people – year round

Swimming and sunbathing - seasonal

Transit vehicle - year round

Access to the beach:

Vehicle

Pedestrian

Official data

The distance to nearest town: Batumi 17.7km

The position of town in relation to survey area: Northern

Residential population of Sarpi: 814 (2014)

Is there any development behind the beach: Yes.

Food and/ or drink outlets on the beach: Yes

Distance from the survey area to the food and/or drink outlet: 100 – 120 m

Present all year round: Yes

Position of food and/or drink outlet in relation to the survey area: Right behind of beach, some café and fast food location. Open whole year and 24/7.

Distance from the beach to the nearest harbor: 17.7 km, Batumi Sea port

Position of harbor in relation to survey area: North

Type of harbor: Universal deep-water, transit, ice-free port.

Size of harbor: number of docks - 11

What is the distance from the beach to the nearest river mouth: 11 km, River Chorokhi

Position of river mouth in relation to survey area: North

Is the beach located near a discharge or discharges of wastewater: Yes. Domestic waste water outlet opened directly to a beach.

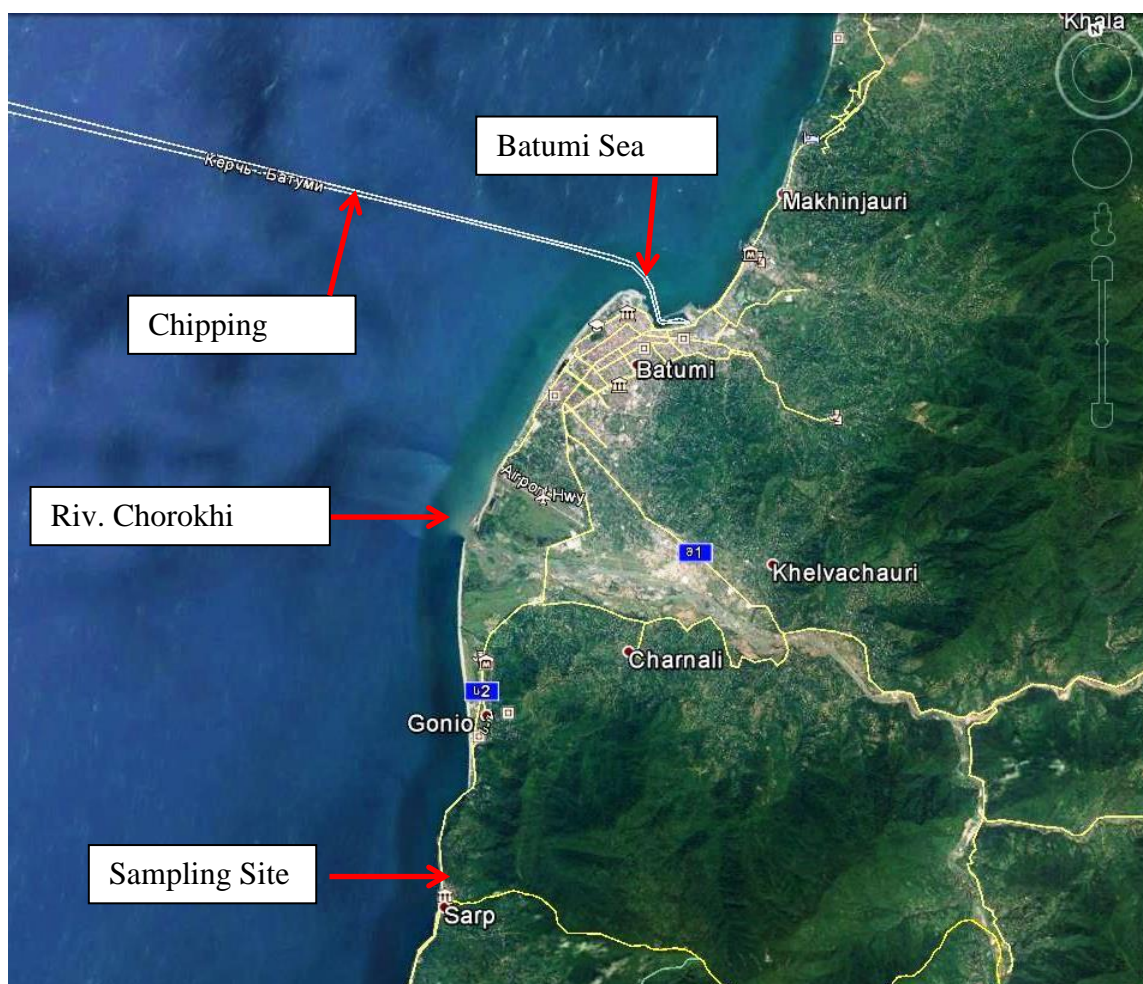


Fig. A1. Sarpi

Name of beach: Kobuleti Northern Periphery (N.P.)

Country: Georgia

Beach width at mean low spring tide: 40 m

Total length of beach: 10 km

GPS coordinates start 50m:

1) 41.895863°; 41.770758° 2) 41.895400°; 41.770827°

3) 41.895854°; 41.771141° 4) 41.895404°; 41.771262°

Coordinate system used: Decimal degrees

Date position measured: 19/10/2016 (d/m/y)

Prevailing currents of the beach: N - W

Prevailing winds: N -W

Type of beach material (% coverage): Pebbles – 10%, sand -90%

Beach topography: slope 3%

Are there any objects in the sea (e.g. a pier) that influence the currents: No

Major beach usage (local people, swimming and sunbathing, fishing, surfing, sailing etc) -

Local people – No

Swimming and sunbathing - seasonal

Transit vehicle - year round

Access to the beach:

Vehicle

Pedestrian

Official data

The distance to nearest town: Batumi - 30 km

The position of town in relation to survey area: South

The beach adjacent territory is unsettled

Population of Kobuleti- 16 546 (2014). Developed recreational center.

Is there any development behind the beach: No

Food and/or drink outlets on the beach: No

Present whole year round: No

Distance from the beach to the nearest harbor: 30 km, Batumi Sea port

Position of harbor in relation to survey area: South

Type of harbor: Universal deep-water, transit, ice-free port.

Size of harbor: number of docks - 11

What is the distance from the beach to the nearest river mouth: 1.8 km, River Natanebi

Position of river mouth in relation to survey area: North

Is the beach located near a discharge or discharges of wastewater: No



Fig..A 2. Kobuleti Northern Periphery

Name of beach: Ureki

Country: Georgia

Beach width at mean low spring tide: 40 m

Total length of beach: 2.5 km

GPS coordinates start 50m:

1) 41.995491° 41.759237°

2) 41.995528° 41.758816°

3) 41.995077° 41.758869°

4) 41.995049° 41.759291°

Coordinate system used: Decimal degrees

Date position measured: 18/09/2018 (d/m/y)

Prevailing current off the beach: N - W

Prevailing winds: N - W

Beach beach developed, walking trail, planted,

Type of beach material (% coverage): Pebbles – 2%, sand -98%

Beach topography: slope 4%

Are there any objects in the sea (e.g. a pier) that influence the currents: Yes

Major beach usage (local people, swimming and sunbathing, fishing, surfing, sailing etc) -

Local people – Yes

Swimming and sunbathing - seasonal

Transit vehicle - year round

Access to the beach:

Vehicle

Pedestrian

Railway

Official data

The distance to nearest town: Poti- 24 km,

The position of town in relation to survey area: North

The beach adjacent territory is settled

Population of Ureki - 1 166 ([2014](#)). Developed recreational center.

Is there any development behind the beach: Yes

Food and/or drink outlets on the beach: Yes

Present whole year round: Yes

Distance from the beach to the nearest harbor: 24 km, Poti Sea port

Position of harbor in relation to survey area: North

Type of harbor: Universal deep-water, transit, ice-free port.

Size of harbor: number of docks - 14

What is the distance from the beach to the nearest river mouth: 0.5 km, River Tskaltsminda; 2.2 km River Supsa

Position of both rivers mouth in relation to survey area: North

Is the beach located near a discharge or discharges of wastewater: No



Common borders. Common Solutions

Fig. A 3 Ureki

Name of beach: Tskaltminda

Country: Georgia

Beach width at mean low spring tide: 15 m

Total length of beach: 225 m

GPS coordinates start 25m:

1) 42.001919° 41.757144°

2) 42.001601° 41.757182°

Coordinate system used: Decimal degrees

Date position measured 31/08/2019(d/m/y)

Prevailing currents of the beach: N - W

Prevailing winds: N -W

Beach beck developed, walking trail, planted,

Type of beach material (% coverage): Pebbles – 2%, sand -98%

Beach topography: slope 4%

Are there any objects in the sea (e.g. a pier) that influence the currents: No

Major beach usage (local people, swimming and sunbathing, fishing, surfing, sailing etc) -

Local people – Yes

Swimming and sunbathing - seasonal

Transit vehicle - year round

Access to the beach:

Vehicle

Pedestrian

Official data

The distance to nearest town: Ureki- 0.35 km,

The position of town in relation to survey area: South

The beach adjacent territory is settled

Population of Ureki - 1 166 ([2014](#)). Developed recreational center.

Is there any development behind the beach: No

Food and/or drink outlets on the beach: No

Present whole year round: No

Distance from the beach to the nearest harbor: 20km, Poti Sea port

Position of harbor in relation to survey area: North

Type of harbor: Universal deep-water, transit, ice-free port.

Size of harbor: number of docks - 14

What is the distance from the beach to the nearest river mouth: 0km, River Tskaltsminda; 2.0 km- River Supsa

Position of both rivers mouth in relation to survey area:- North

Is the beach located near a discharge or discharges of wastewater: No



Fig. A 4. Tskaltsminda

Name of beach: Maltakva

Country: Georgia

Beach width at mean low spring tide: 70 m

Total length of beach: 4 km

GPS coordinates start 50m:

1) 42.106951°41.684872°

2) 42.106579°41.685344°

Coordinate system used: Decimal degrees

Date position measured: 31/08/2019 (d/m/y)

Prevailing currents of the beach: N - W

Prevailing winds: N -W

Beach beck developed, walking trail, planted,

Type of beach material (% coverage): Pebbles – 2%, sand -98%

Beach topography: slope4%

Are there any objects in the sea (e.g. a pier) that influence the currents: No

Major beach usage (local people, swimming and sunbathing, fishing, surfing, sailing etc) -

Local people – Yes

Swimming and sunbathing - seasonal

Transit vehicle - year round

Access to the beach:

Vehicle

Pedestrian

Official data

The distance to nearest town: Poti- 2 km,

The position of town in relation to survey area:North

The beach adjacent territory is settled

Population of Potii–47900 (20142). Low developed recreational center.

Is there any development behind the beach: No

Food and/or drink outlets on the beach: No

Present whole year round:No

Distance from the beach to the nearest harbor: 2 km, Poti Sea port

Position of harbor in relation to survey area: North

Type of harbor: Universal deep-water, transit, ice-free port.

Size of harbor: number of docks - 14

What is the distance from the beach to the nearest rivermouth: 0km, River Maltakva 2.4km

Position of rivers mouth in relation to survey area:- South

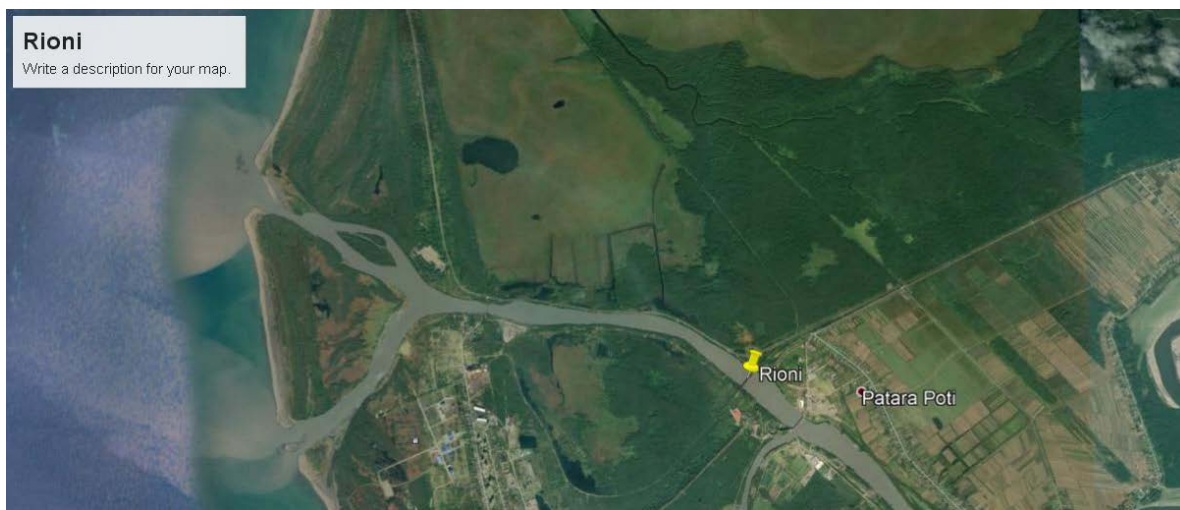
Is the beach located near a discharge or discharges of wastewater: No



Fig. A 5. Maltakva

Position of the bridges used in riverine litter survey

Riv. Rioni



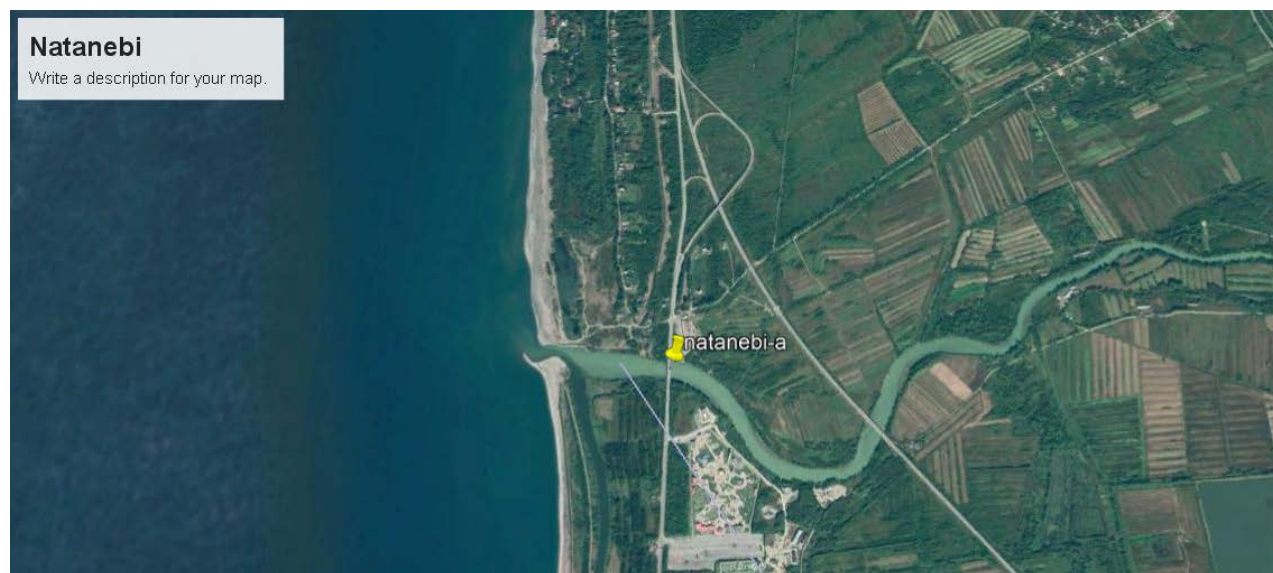
Bridge on Riv. Rioni

Riv. Supsa



Bridge on Riv. Supsa

Riv. Natanebi



Bridge on Riv. Natanebi

Riv. Chorokhi



Bridge on riv. Chorokhi

Common borders. Common Solutions