Coalition Clean Baltic
For protection of the Baltic Sea environment

River Watch
A manual for public environmental monitoring
APPENDIX 8. The methodology for monitoring the marine macro litter on beaches

Introduction:

Marine litter represents all synthetic or processed items or fragments that people have discarded or lost on the coasts. Floating in the water plastic bottles, forgotten or abandoned tins, gears, and rags: all these things are man-made items which had found their ways into the water.

Plastic litter getting into the seas and oceans with water flows accumulates into so-called "garbage patches" with the total area exceeding a million square kilometers. Rivers discharge quite a huge amount of litter into the seas.

In order to understand where from such litter originates, how it accumulates in the water and on the coasts, and what we can do to solve this problem, it is necessary to examine the types of litter and their origins.

GENERAL APPROACHES TO ORGANIZATION OF SURVEYS

Frequency and timing of surveys
At least four surveys in autumn, winter, summer, spring should be carried out within the scope of the project:
1.   Autumn: mid-September – mid-October
2.   Winter: mid-December – mid January (for snowless territories located in the south)
3.   Spring: April
4.   Summer: mid-June – mid-July
 Bad weather conditions should be avoided as they can cause unsafe conditions for holding the surveys.

The object of surveys
All items with dimensions exceeding 2.5 cm are considered as macro-litter.
A fixed segment of the beach from the strandline to the back of the beach is called the sampling unit. A sampling unit to be used within the frame of the project is a 100-meter stretch from the strandline to 10 meters back. Two sections of a 100-meter stretch on the same beach distanced from each other by no less than 50 m should be monitored. The same sites should be monitored for all surveys through the year.
In order to identify the start and end points of each sampling unit, permanent reference points can be used with coordinates obtained by GPS.
Before any sampling begins, characterization of the shoreline (primarily, a remote from the strandline part of the beach) should be completed with consideration of the coastal special features: vegetation, dunes, a road, fencing, and other anthropogenic constructions, e.g., dams, piles of boulders, other specific objects.
Recommendations: in case of heavily polluted beaches, survey two 50-meter long segments.

Equipment / Consumables
The following items are necessary to carry out beach surveys:
Protocol forms: BEACH IDENTIFICATION SHEET, SURVEY BULLETIN, and TABLE OF LITTER TYPES
Digital camera
Hand-held GPS unit or a cell phone
Flag markers/stakes (to mark the four corners of the studied area)
100-meter measuring tape (you can use a bunch of marked-off string 50-100 meter long)
First aid kit (to include sunscreen, bug spray, drinking water)

Protective gloves
Clipboard with a pencil
Rubbish bags
Rigid container and sealable lid to collect sharp items such as needles, etc.
Appropriate clothing;
Scales (if possible to weight your bags of collected debris)

PROCEDURE FOR THE EXAMINATION

EXAMINATION PROTOCOLS

The procedure has in use three protocols.
1. **The Beach Identity Sheet**
This is the protocol to put all the information on the beach and the surveyors into. This information will later on help to analyze which weather and other conditions affect the amount of litter on the beach and what special features the area has. This protocol may be filled in after the actually monitoring.
2. **The Survey Sheet (100 m).**
The general survey data is put into this sheet.
3. **The Table of Litter Types**
The data on all types of litter identified in the course of the monitoring is put into this table. This form is convenient for categorizing the litter in the process of measuring the litter collected over the area and its further analysis.

4. **Choice of the segment**
The segment should be selected in the area of mass public visitation; it should be reasonably close to the areas of active exploitation of the coastal zone.
These might be the segments:
- Nearby ports or havens
- Nearby river mouths
- Nearby coastal city districts
- Nearby popular tourist routes

Besides this, the selected segment should:
- Be no less than 100 m long
- Have a gentle incline (~1.5-4.5º), which excludes minor tides
In the bays and havens where there practically are no tides, the latter condition is of low importance (e.g., the Neva Bay of the Gulf of Finland, the Couronian Lagoon, etc.)
- Have an open access to the sea (with no blocking breakwaters or dams), so that such constructions would not block the litter from getting from the sea onto the beaches
- Be accessible for the surveyors round the year.

IMPORTANT!
- It is expedient to survey the beaches where no regular cleaning is taking place. In case the beach has undergone a cleaning, not only the time of the monitoring but also of the cleaning should be registered; this would allow to estimate the amount of litter accumulated (within a time unit).
- There should be no threat to endangered species, such as rare birds, marine mammals, or coastal plants; in many cases, this might exclude protected zones from the survey but it depends upon the local regulations.
- In each case, these criteria should be abided in the most strict way, with consideration of your expert skills and knowledge, in surveying specific coastal zones and the situation with marine litter as a whole for the final selection of beaches to be surveyed.

2. Description of the surveyed segment prior to the beginning of the monitoring
(The data is put in the Beach Identity Sheet)
Prior to the beginning of the survey, it is necessary to:

A) Describe each segment and the conditions of holding the survey
B) Write down the GPS coordinates of the segment
C) Point out all specific features of the surveyed segment including the types of soils (sand, pebbles, etc.), topography of the beach, purposes of the beach use, remoteness from urban areas, navigation routes, river mouths, etc.
D) Take photos for fixing physical characteristics of the surveyed segment.

3. **Collection and identification of the litter**

(The data is put in the Beach Survey Sheet and the Table of Litter Types)

Limitations on the dimensions and amounts of samples for examination

There are no "upper" size limits to litter recorded on beaches. The book has a description of what is marine litter. If the item matches it, then yes, it is litter. Litter items with a lower limit of 2.5 cm in the longest dimension will be monitored, ensuring the inclusion of caps & lids and cigarette butts, even if their dimensions are less than 2.5 cm.

In case of identification of particularly huge and heavy items, it would be enough just to register their presence if there is no way to deliver them to the nearest litter collection point.

All items found on the sampling unit should be entered on the 'Beach Litter Monitoring Sheet'. On the sheet, each type of items is given a unique identification number. Data should be entered on the sheet while picking up the litter item.

✓ Pieces of litter that are recognizable e.g., as a shopping bag (G3) should be registered as such.
✓ Pieces of materials that are not recognizable as an item should be counted according to their size (sections G79 –G83). Unknown litter or items that are not on the survey sheet should be noted in the appropriate "other item box". A short description of the item should then be included in the survey sheet along with digital photos and a short description, so that they can be identified later and, if necessary, be added to the survey sheet.

All litter items should be removed from the beach during the survey. Larger items that cannot be removed (safely) by the surveyors should be marked with, for example, paint spray, so that they will not be counted again at the next survey. The litter collected should be disposed of properly, taken to the nearest litter collector or, even better, preliminary arrangements with the local municipality on removing the litter you will have collected should be made.

4. **Quantification of the litter**

The resulting amount of the litter should be totaled in the table columns by each type of litter. This general total will be considered as the amount of litter of this type per square meter (m^2). If possible, the major categories of litter should be weighted.

This methodology has been developed on the basis of the Methodology for Monitoring Marine Litter on Beaches worked out by the group of authors of the DeFishGear, defishgear.net Project.

WHAT CAN WE DO BASED ON THE MONITORING OUTCOMES

Each monitoring gives an idea of what sort of litter is more typical for this area (a beach, a part of a beach, of the coast as a whole). The data of international scholars tell us that food packing and plastics make up to 80% of all marine litter. However, you will learn that each beach area has its own unique composition of litter. Thus, disposable tableware can predominate at a particular beach, while glass and cotton swabs at another one. This depends upon a whole variety of reasons: location of the beach, amounts of campers, dominating wind flows, amount of ship lanes, and others. However, we can trace down the potential sources of litter and think what to focus our efforts on afterwards, in our countering the litter dissemination.

What can tell the items we found?

For example, the abundance of **personal hygiene means and cotton swabs** found on the beach can indicate the lack of waste water treatment facilities and a located nearby source of residential waste waters. In such case the quality of water might be rather low.
What can you do?
There is a good reason to inform the local administration about your conclusions and apply to a SES with a request to make an analysis of waste waters on microbiological and nitrate pollution.

Some **ordinary daily waste** could be just left behind by the campers, brought in by the winds, or washed ashore by flows from other beaches. In any case, public's behavior is always the key source: utilization of extra packing of goods, purchasing disposable goods, and throwing garbage away in the natural areas.
What can you do?
- Purchase the goods with lesser amounts of packing
- Stop using disposable items
- Recycle the garbage
- Make arrangements with local municipalities on installation of garbage bins with tops in the beach areas and nearby them (and beach cafés as well)
- Negotiate with the local municipality on mounting sign plates with information telling about the damages caused by the litter and the necessity of its proper managing
- And anything else you can think of on your own…

Construction debris gets to the coasts, mostly, because of irresponsible or unprofessional waste management at a construction site. In the major part, these are pieces of construction sacks, insulation materials (for walls and floors), plastic parts of decoration materials, etc.
What can you do?
- Submit a complaint to a relevant authority body or inform journalists. Please remember, that mass media is a very efficient way to make the issue known to general public and a solution to be found.

Foods and drinks outlets right on the beach with no adequate garbage collectors often are the cause of the big amounts of litter. This is the sort of litter like disposable cups, napkins, plates, and tableware.
What can you do?
- Write notes about and suggestions for the improvement in the book of complaints of the particular café
- As a client, you can vote with your wallet and buy nothing there
- Make the issue public through using mass media
- Get together with a group of like ten other active like yourself people and make sure the issue is resolved; you can apply to the local authority.

The litter from faraway: If you have found something like a yogurt cup or any other item with no marking on the package in your national language, it very well might be that the items got here from a ship. At that, it is important to understand that a tin can or a food packing from neighboring Baltic countries could get to our beaches "on their own." On the contrary, items from faraway countries, like South Africa of Latin America, most likely were thrown off from board of a ship.
What can you do?
- Educate people around you that it is a bad thing to throw garbage into the sea
- Send letters to major transportation companies with a request to place information on boards of their ships with warnings explaining why it is wrong to throw the garbage off into the sea.

Not only the wind can be the means of transferring litter into the water or on the coasts, but also **birds** might be doing this, especially if a **landfill** with a huge accumulation if waste is nearby. Landfills located in the coastal zones cause a lot of problems: from polluting underground waters and, further on, the seas, with chemical substances and up to a bad smell and transfer of litter onto the coasts.

What can you do?
- One soldier does not make a battle, and alone you cannot influence the deployment of a landfill with just sending a letter. However, if you assemble an action group or send appeals en masse, get the support of mass media and prominent people living in the area, you can very well reach the success.

- In the very least, it is essential to tell the people around you about the harm caused by this particular location of the landfill.
- And, again, do remember that the most part of a landfill is composed of disposable items and packing. It is always important to educate people about their environmentally safe choices of goods.

If you have accomplished the monitoring, you already are on the way to solving the problem.
Unfortunately, we cannot describe all sorts of litter and indicate their exact origins in this manual.
This is a task for you, as a resident of the region. The most essential thing is to understand what is located near the coast and can be a source of worsening our environment, our rivers and the sea.

Monitoring Marine Litter on Beaches

Beach Identity Sheet

Name of surveyor: _____

_____

Date of survey: …………./…………./…………. (day/month/year)

Name of the beach (if any) …………………………………………………………………………

The nearest city _____

Length of the beach: …………………………………………………………………………..

Back of the beach (e.g., steep, dunes, etc.): ………………………………………………………………

GPS coordinates start 100m: ………………………………………………………………………….

GPS coordinates end 100m: ………………………………………………………………………….

GPS coordinates start 10m: …………………………………………………………………

GPS coordinates end 10m: ……………………………………………………………………

Coordinate system used: ………………………………………………………………………

Prevailing currents off the beach: □N □E □S □W

Prevailing winds: □N □E □S □W

When you look from the beach to the sea, what direction is the beach facing: □N □E □S □W

Type of beach material (% coverage): (*e.g. sand 60%, pebbles 40%, sand with big rocks, grass, asphalt/concrete)* ……………………………………………………………………………………………………

Beach topography: *(e.g., slope 20%)*: ………………………………………………………………………

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

_____

Major beach usage (local people, swimming and sunbathing, fishing, surfing, sailing, etc.):		
…………………………………….	seasonal or whole year round:	………………………………………
…………………………………….	seasonal or whole year round:	………………………………………
…………………………………….	seasonal or whole year round:	………………………………………

_____

Access to the beach: □ Vehicle □ Pedestrian □ Boat*

_____

What is the distance to nearest town:**…………………….**

What is the position of town in relation to survey area:

What is the (seasonal) population size of this town:

□Residential:				
□Residential and tourists	Winter		□Tourists	Winter
	Spring			Spring
	Summer			Summer
	Autumn			Autumn

Is there any development behind the be   □No

□Yes; please, describe:

……..

Are there food and/or drink outlets on the beach: ☐Yes ☐No

 Yes What is the distance from the survey area to the food and/or drink outlet
(km) …………….

☐Yes ☐No

Present all year round: Please specify: ………….

……………………………………….

□ N □ E

Position of food and/or drink outlet in relation to the survey area, e.g.   □ S □ W

_____

What is the distance from the beach to the nearest shipping lane (km):   ……………………………..

What is the estimated traffic density (number of ships/year):   ……………………………..

Is it used mainly by merchant ships, fishing vessels or all kinds:

……………………………..

Position of shipping lane in relation to survey: □N □E □S □W

_____

What is the distance from the beach to the nearest harbor (km): ……………………………………

What is the name of the harbor……………………………………………………………………….

Position of harbor in relation to survey area   □N □E □S □W

Type of the harbor:……………………………………………………………………………………

Size of harbor (number of ships):……………………………………………………………………..

_____

What is the distance from the beach to the nearest river mouth……………………………………………….

What is the name of the river:……………………………………………………………………..

Position of river mouth in relation to survey area: □N □E □S □W

_____

Is the beach located near a discharge or discharges of waste water: …………………………………………

What is the distance from the beach to the discharge points (km): …………………………………………..

Position of discharge points in relation to survey area: □N □E □S □W

_____

How often is the beach cleaned: ☐Daily

☐Weekly ☐Monthly

☐Other

……………………………………………

All year round:
Seasonal; please, specify the months: ……………………………………………

☐Daily ☐Weekly ☐Monthly ☐Other

What method is used: ☐Manual ☐Mechanical

Who is responsible for the cleaning: ……………………………………………

……………………………………………

_____

Additional comments and observations about the beach:

……

………

………

………

………

………

………………………………………………………………………………………………………

_____

Please include:

1. A map of the beach

2. A map of the beach and the local surroundings. When relevant please mark on this map the following:

☐ Nearest town   ☐ Food/drink outlets   ☐ Nearest shipping lane

☐ Nearest harbor   ☐ Nearest river mouth   ☐ Discharge of waste water

3. A regional map

Date the sheet is filled in: ……../…….../……..   (day/month/year)

Name of contact person in case of any questions:……………………………………………………………………….

E-mail: ………………………………………………………………….

Monitoring Marine Litter on Beaches

Name of the beach………………………………….

Name of surveyor 1: ……………………………

e-mail: ……………………………………………………

Phone …………………………………………….

Administrative District,

Name of surveyor 2: ……………………………...

The nearest settlement:……………………………

e-mail: ……………………………………………………

Phone …………………………………………….

Total number of surveyors……………………….

Date of survey: …………/…………./…………. (day/month/year)
Date of the end of survey: ……………………………………………………………………………………….

Additionally information

When was the beach last cleaned: …………/…………./………….

Did you divert from the predetermined 100 meters: □No   □ Yes. Please specify………………………….

_____

Did any of the following weather conditions affect the data of the survey? If so please tick appropriate box:

□ Wind □Rain □Snow □Ice □Fog
□Sand storm   □Exceptionally high tide

_____

Did you find stranded or dead animals: □No   □ If so how m
Please describe the animal, or note the species name if know
                                                                □Alive □Dead
Dead Sex of animal (if known): ……………………………………………………………………………………….
Age of animal (if known): …………………………………………………………………………………………….
Is the animal entangled in litter: Yes   No
If so please describe nature of the entanglement and type of litter………………………………………………
_____

Were there any circumstances that influenced the survey? For example tracks on the beach (cleaning or other), recent replenishment of the beach or problems with identification of the objects, etc. Please specify: ………
……..

Were there any events that lead to unusual types and/or increase of amounts of litter on the beach? Please specify: …………………………………………………………………………………………………….

TABLE OF LITTER TYPES

ARTIFICIAL POLYMER MATERIALS			
Code	Items name	Item counts	Total
G1	4/6-packyokes, six-pack rings		
G3	Shopping Bags, incl. pieces		
G4	Small plastic bags, e.g. freezer bags, including pieces		
G5	Plastic bag collective role; what remains from rip-off plastic bags		
G7	Drink bottles<=0.5l		
G8	Drink bottles>0.5l		
G9	Cleaner bottles&containers		
G10	Food containers incl. fast food containers		
G11	Beach use related cosmetic bottles and containers, eg. Sun blocks		
G12	Other cosmetics bottles & containers		
G13	Other bottles & containers (barrels)		
G14	Engine oil bottles&containers<50 cm		
G15	Engine oil bottles&containers> 50 cm		
G16	Jerry cans (square plastic containers with handle		
G17	Injection gun containers		
G18	Crates and containers / baskets		
G19	Car parts		
G21	Plastic caps/lids drinks		
G22	Plastic caps/lids chemicals, detergents (non-food)		
G23	Plastic caps/lid sun identified		
G24	Plastic rings from bottle caps/lids		
G25	Tobacco pouches / plastic cigarette box packaging\		
G26	Cigarette lighters		
G27	Cigarette butts and filters		
G28	Pens and pen lids		
G29	Combs/hair brushes/sunglasses		
G30	Crisps packets/sweets wrappers		
G31	Lolly sticks		
G32	Toys and party poppers		
G33	Cups and cup lids		
G34	Cutlery and trays		
G35	Straws and stirrers		
G36	Fertilizer/animal feedbags		
G37	Mesh vegetable bags		
G40	Gloves (washing up		
G41	Gloves (industrial/professional rubber gloves)		
G42	Crab/lobster pots and tops		
G43	Tags (fishing and industry)		
G44	Octopus pots		

G45	Mussels nets, Oyster nets		
G46	Oyster trays (round from oyster cultures		
G47	Plastic sheeting from mussel culture (Tahitians)		
G49	Rope (diameter more than 1cm)		
G50	String and cord (diameter less than 1cm)		
G53	Nets and pieces of net < 50 cm		
G54	Nets and pieces of net > 50 cm		
G56	Tangled nets/cord		
G57	Fish boxes–plastic		
G58	Fish boxes – expanded polystyrene		
G59	Fishing line/monofilament (angling)		
G60	Light sticks (tubes with fluid) incl. packaging		
G62	Floats for fishing nets		
G63	Buoys		
G64	Fenders		
G65	Buckets		
G66	Strapping bands		
G67	Sheets, industrial packaging, plastic sheeting		
G68	Fibre glass/fragments		
G69	Hard hats/Helmets		
G70	Shotgun cartridges		
G71	Shoes/sandals		
G72	Traffic cones		
G73	Foam sponge		
G79	Plastic pieces 2.5 cm >< 50cm		
G80	Plastic pieces> 50 cm		
G82	Polystyrene pieces 2.5 cm >< 50cm		
G83	Polystyrene pieces> 50 cm		
G84	CD, CD-box		
G85	Salt packaging		
G86	Fin trees (from fins for scuba diving		
G87	Masking tape		
G88	Telephone (incl. parts)		
G89	Plastic construction waste		
G90	Plastic flower pots		
G91	Biomass holder from sewage treatment plants		
G92	Bait containers/packaging		
G93	Cable ties		
G95	Cotton bud sticks		
G96	Sanitary towels/panty liners/backing strips		
G97	Toilet fresheners		
G98	Diapers/nappies		
G99	Syringes/needles		
G100	Medical/Pharmaceuticals containers/tubes		
G101	Dog faeces bag		
G102	Flip-flops		
G124	Other plastic/polystyrene items (identifiable)		

		Total weight (kg)	

RUBBER

Code	Items name	Item counts	Total
G125	Balloons and balloon sticks		
G126	Balls		
G127	Rubber boots		
G128	Tires and belts		
G129	Inner-tubes and rubber sheet		
G130	Wheels		
G131	Rubber bands (small, for kitchen/household/post use)		
G132	Bobbins (fishing)		
G133	Condoms (incl. packaging)		
G134	Other rubber pieces		
		Total weight (kg)	

CLOTH/TEXTILE\ ОДЕЖДА,ТЕКСТИЛЬ

Code	Items name	Item counts	Total
G137	Clothing / rags (clothing, hats, towels)		
G138	Shoes and sandals (e.g. Leather, cloth)		
G139	Backpacks & bags		
G140	Sacking (hessian)		
G141	Carpet&Furnishing		
G142	Rope, string and nets		
G143	Sails, canvas		
G144	Tampons and tampon applicators		
G145	Other textiles (incl. rags)		
		Total weight (kg)	

PAPER/CARDBOARD

Код	Наименование	Количество	Всего
G147	Paper bags		
G148	Cardboard (boxes & fragments)		
G150	Cartons/Tetrapack Milk		
G151	Cartons/Tetrapack (others)		
G152	Cigarette packets		
G153	Cups, food trays, food wrappers, drink containers		
G154	Newspapers & magazines		
G155	Tubes for fireworks		
G156	Paper fragments		
G158	Other paper items		
		Total weight (kg)	

PROCESSED/WORKED WOOD

Code	Items name	Item counts	Total
G159	Corks		
G160	Pallets		
G161	Processed timber		
G162	Crates		
G163	Crab/lobsterpots		
G164	Fishboxes		
G165	Ice-cream sticks, chip forks, chopsticks, toothpicks		
G166	Paint brushes		
G167	Matches & fireworks		
G171	Other wood< 50 cm		
G172	Other wood> 50 cm		
		Total weight (kg)	

METAL			
Code	Items name	Item counts	Total
G174	Aerosol/Spray cans industry		
G175	Cans (beverage)		
G176	Cans (food)		
G177	Foil wrappers, aluminum foil		
G178	Bottle caps, lids&pull tabs		
G179	Disposable BBQ's		
G180	Appliances (refrigerators, washers, etc.)		
G181	Tableware (plates, cups & cutlery)		
G182	Fishing related (weights, sinkers, lures, hooks)		
G184	Lobster/crab pots		
G186	Industrial scrap		
G187	Drums, e.g. oil		
G188	Other cans (< 4 L)		
G189	Gas bottles, drums & buckets (> 4 L)		
G190	Paint tins		
G191	Wire, wire mesh, barbed wire		
G193	Car parts / batteries		
G194	Cables		
G195	Household Batteries		
G198	Other metal pieces < 50 cm		
G199	Other metal pieces > 50 cm		
		Total weight (kg)	

GLASS/CERAMICS			
Code	Items name	Item counts	Total
G200	Bottles, including pieces		
G201	Jars, including pieces		

Code	Items name		Total
G202	Light bulbs		
G203	Tableware (plates & cups)		
G204	Construction material (brick, cement, pipes)		
G205	Fluorescent light tubes		
G206	Glass buoys		
G207	Octopus pots		
G208	Glass or ceramic fragments >2.5cm		
G210	Other glass items		
		Total weight (kg)	

UNIDENTIFIED AND/OR CHEMICALS			
Code	**Items name**	**Item counts**	**Total**
G211	Other medical items (swabs, bandaging, adhesive plaster, etc.)		
G213	Paraffin/Wax		
		Total weight (kg)	