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For a Litter-Free Adriatic and Ionian Coast and Sea

# Methodology for Monitoring Marine Litter on Beaches

Macro-Debris (>2.5cm)



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**Prepared by:** Thomais Vlachogianni (MIO-ECSDE, DeFishGear WPL)

**With contributions from:** Vicky Paraskevopoulou & Vaggelis Kalampokis (MIO-ECSDE),  
Andreja Palatinus & Stefan Trdan (IWRS), Stefano Di Muccio, Luigi Alcaro & Francesca Ronchi (ISPRA),  
Cristina Mazziotti (ARPA), Christina Zeri & Eleni Kamperi (HCMR)



The project is co-funded by the European Union,  
Instrument for Pre-Accession Assistance





DeFishGear

The IPA-Adriatic funded DeFishGear project aims to facilitate efforts for integrated planning to reduce the environmental impacts of litter-generating activities and ensure the sustainable management of the marine and coastal environment of the Adriatic-Ionian macroregion. The DeFishGear activities are implemented by a multi-disciplinary team comprising academia, research institutes, national and local authorities and NGOs from all seven countries of the Adriatic and Ionian Seas, reinforcing and strengthening cooperation and fostering joint and harmonized actions towards a litter-free Adriatic and Ionian Coast and Sea.

*This publication has been prepared by the DeFishGear Work Package Leader Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE), with contributions from the DeFishGear partners: Institute for water of the Republic of Slovenia (Ljubljana, Slovenia), Italian National Institute for Environmental Protection and Research (Rome, Italy), Regional Agency for Environmental Protection in the Emilia-Romagna region (Bologna, Italy), Hellenic Centre for Marine Research (Anavyssos, Greece)*

*“This publication has been produced with the financial assistance of the IPA Adriatic Cross-Border Cooperation Programme. The contents of this publication are the sole responsibility of project partners and can under no circumstances be regarded as reflecting the position of the IPA Adriatic Cross-Border Cooperation Programme Authorities”.*

## 1. Introduction

The following methodology has been prepared based on the EU MSFD TG10 “Guidance on Monitoring of Marine Litter in European Seas (2013)”, the OSPAR “Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area (2010)” and the NOAA “Marine Debris Monitoring and Assessment: Recommendations for Monitoring Debris Trends in the Marine Environment (2013), taking into consideration the draft “UNEP/MAP MEDPOL Monitoring Guidance Document on Ecological Objective 10: Marine Litter (2014)”.

## 2. Site selection

The sites to be monitored should be selected randomly but taking into consideration certain criteria. The selected beaches should be situated:

- ✓ In the vicinity of ports or harbors;
- ✓ In the vicinity of river mouths;
- ✓ In the vicinity of coastal urban areas;
- ✓ In the vicinity of tourism destinations;
- ✓ In relatively remote areas.

In addition, the selected beaches should:

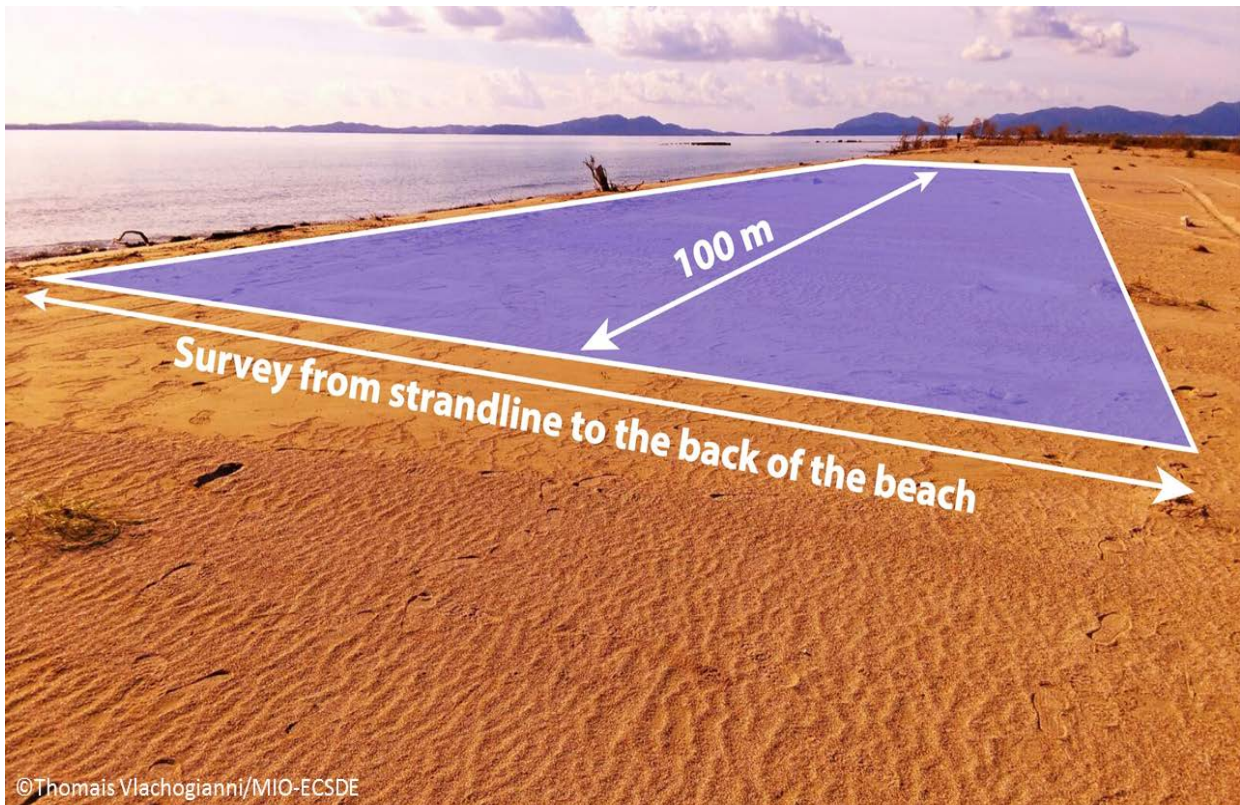
- ✓ Have a minimum length of 100m;
- ✓ Be characterized by a low to moderate slope (~1.5-4.5°), which excludes very shallow tidal mudflat areas;
- ✓ Have clear access to the sea (not blocked by breakwaters or jetties);
- ✓ Be accessible to survey teams throughout the year;
- ✓ Ideally not be subject to cleaning activities. In case they are subjected to litter collection activities the timing of non-survey related beach cleaning must be known so that litter flux rates (the amount of litter accumulation per unit time) can be determined.

Make sure that the survey will not pose any threat to endangered or protected species and their habitats, such as sea turtles, sea birds or shore birds, marine mammals or sensitive beach vegetation; in many cases this would exclude protected areas but it depends on local management arrangements.

In each site selection, these criteria should be followed as closely as possible. However, when making the final selection of the beaches to be monitored the surveyors can use their expert judgment and experience related to the coastal area and marine litter situation in their respective country.

## 3. Sampling units

Within this methodology 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. The sampling unit should be a 100-metre stretch of beach along the strandline and reaching to the back of the beach (see figure 1). The back of the beach needs to be explicitly identified using coastal features such as the presence of vegetation, dunes, cliff base, road, fence or other anthropogenic structures such as seawalls (either piled boulders or concrete structures). Two (2) sampling units (100-metre stretches) on the same beach should be monitored. They should be separated at least by a 50-metre stretch. The same sampling units should be monitored for all repeat surveys. In order to define the boundaries of each sampling unit, permanent reference points can be used and coordinates should be obtained by GPS. In case of heavily littered beaches, 100-metre stretches may be too difficult to survey and therefore two 50-metre stretches should be surveyed instead.



**Figure 1.** The sampling unit.

#### 4. Frequency and timing of surveys

At least four surveys should be carried out in autumn, winter, summer and spring.

The proposed survey periods are:

1. Autumn: mid September-mid October
2. Winter: mid December-mid January
3. Spring: April
4. Summer: mid June-mid July

It should be kept in mind that any circumstances that may lead to unsafe situations for the surveyors such as heavy winds, etc. should not be undermined. The safety of the surveyors must always come first!

#### 5. Pre-survey characterization of sites

Before any survey begins, shoreline characterization should be completed for each sampling unit. The GPS coordinates of all four corners of the sampling unit should be recorded. A site ID name should be created and used for the duration of the study. The site's special features, including characterization of the type of substrate (sand, pebbles, etc.), beach topography, beach usage, distances from urban settlements, shipping lanes, river mouths, etc., should be recorded using the 'Beach Identity Sheet' (Annex I). Digital photographs should be taken to document the physical characteristics of the monitoring site.

## 6. Litter size limits to be surveyed

There are no upper size-limits for litter items to be recorded on beaches. But in order to ensure the inclusion of caps, lids, cigarette butts and other similar items in the quantification of beach litter, items as small as 2.5 cm in the longest dimension have to be recorded. In case such items are found in extremely high numbers, a 1-meter (rather than a 100-meter) beach transect should be used instead, saving effort and time.

## 7. Collection and identification of litter

Items found in the sampling unit will be classified by type according to the 'Master List' and accordingly entered in the 'Beach Litter Monitoring Sheet' (Annex II). On the sheet, each type of item is given a unique identification number. Data should be entered on the sheet while picking up the litter item.

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 on the survey sheet. If possible, digital photos should be taken of the unknown items.

### Interpreting small pieces of litter in a harmonized way

- ✓ 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 e.g. plastic and/or polystyrene pieces should be counted according to their size (G75-G83).

During the survey, all litter items should be sorted by 'category type', weighed and then removed from the beach. Larger items that cannot be removed (safely) by the surveyors should be marked, for example with paint spray (which meets environmentally friendly standards) so that they are not counted again at the next survey. The litter collected should be disposed of properly. Regional or national regulations and arrangements should be followed. If these do not exist, local municipalities should be informed.

## 8. Quantification of litter

The unit to be used to assess the litter density is 'number of items' and should be expressed as counts of litter items per square metre (m<sup>2</sup>). In addition, the main category types of litter items should be weighed.

## 9. Equipment/Consumables

The following items are necessary to carry out beach surveys:

- ✓ Digital camera
- ✓ Hand-held GPS unit
- ✓ Extra batteries (ideally rechargeable batteries)
- ✓ 100-metre tape measure (fiberglass preferred)
- ✓ Flag markers/stakes
- ✓ First aid kit (to include sunscreen, bug spray, drinking water)
- ✓ Protective gloves
- ✓ Clipboard for each surveyor
- ✓ Recording sheets (printed on waterproof paper)
- ✓ Pencils
- ✓ Rubbish bags
- ✓ Rigid container and sealable lid to collect sharp items such as needles, etc.
- ✓ Appropriate clothing
- ✓ Scales (if possible to weigh your bags of collected debris)

## 10. Safety

Safety should be the number one priority during any survey activity. Since this work is carried out in the field, there are a few inherent hazards. Caution should be used and the general safety guidelines presented below should be followed.

- Wear appropriate clothing. Be sure to wear close-toed shoes and gloves when handling debris as there may be sharp edges.
- If you come across a potentially hazardous material (e.g. oil or chemical drums, gas cans, propane tanks), contact competent authorities to report the item, providing as much information as possible. Do not touch the material or attempt to move it.
- Large, heavy objects should be left in place. Do not attempt to lift heavy debris objects as they may have additional water weight and lifting them could result in injury.
- When in doubt, don't pick it up! If unsure of an item, do not touch it. If the item is potentially hazardous, report it to the appropriate authorities.
- Do not conduct field operations in severe weather conditions.
- Be aware of your surroundings and be mindful of 'trip and fall' hazards.
- Carry a means of communication for emergencies, for example a cell phone.
- Always carry a first aid kit. The kit should include an emergency water supply and sunscreen, as well as bug spray.
- Understand the symptoms of heat stress and actions to treat it.
- Make sure to carry enough water.
- Let someone know where you are and when you expect to return.
- The surveyor team should be composed of at least two people.

## 11. Additional considerations

The amount and type of litter found on beaches can be influenced by different circumstances. To ensure that data will be analyzed and interpreted properly these circumstances must be recorded. Indicative examples of such circumstances include: events that may lead to unusual types and/or amounts of litter (e.g. shipping container losses, overflows of sewage treatment systems, etc.); difficult weather conditions (e.g. heavy winds or rain, etc.); replenishment/nourishment of the beach; etc.

## 12. References

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Annex I: Beach Identity Sheet

Annex II: Survey Sheet (100m)

# Monitoring Marine Litter on Beaches

## Beach Identity Sheet

**Name and area of beach:** .....

**Beach ID:** .....

**Country:** .....

1. Beach width at mean low spring tide (m): .....

2. Beach width at mean high spring tide (m): .....

3. Total length of the beach (m): .....

4. Back of beach (e.g. cliffs, dunes, etc.): .....

5. GPS coordinates of the four corners of the sampling unit:

A: .....

B: .....

C: .....

D: .....

6. Coordinate system used: .....

7. Date coordinates were measured: ...../...../.....(d/m/y).....

8. Prevailing sea currents off the beach:  N  E  S  W

9. 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%)

Beach topography: ..... (e.g. slope 20%)

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

Prevalent beach usage (local people, swimming and sunbathing, fishing, surfing, sailing, etc.):		
1. ....	seasonal or whole year round:	.....
2. ....	seasonal or whole year round:	.....
3. ....	seasonal or whole year round:	.....

Access to the beach:  Vehicle  Pedestrian  Boat\*





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

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

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

Residential:

Residential and tourist      winter  
    spring  
    summer  
    autumn

Tourist      winter  
                                    spring  
                                    summer  
                                    autumn

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**Is there any development behind the beach:**

No  Yes, please describe

.....

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**Are there food and/or drink outlets on the beach:**

No  Yes

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

Present all year round:

Yes  No

please specify: .....

.....

Position of food and/or drink outlet in relation to the survey area:

N  E  S  W

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**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 area:

N  E  S  W

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**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 harbor: .....

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

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**What is the distance from the beach to the nearest river mouth (km):** .....

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

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**How often is the beach cleaned:** Daily Weekly Monthly Other

All year round: .....

Seasonal, please specify in months: .....

Daily Weekly Monthly Other

What method is used: Manual Mechanical

Who is responsible for the cleaning: .....

.....  
.....  
.....

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**Additional comments and observations about this 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:

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Nearest town   | <input type="checkbox"/> Food/drink outlets  | <input type="checkbox"/> Nearest shipping lane                  |
| <input type="checkbox"/> Nearest harbor | <input type="checkbox"/> Nearest river mouth | <input type="checkbox"/> Discharge or discharges of waste water |

3. A regional map

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Date sheet is filled in: ...../...../..... (d/m/y)

Name: .....

E-mail: .....

# Monitoring Marine Litter on Beaches

## Survey Sheet (100m)

Name and area of beach: ..... Name of surveyor 1: .....  
Beach ID: ..... e-mail address: .....  
Country: ..... Name of surveyor 2: .....  
e-mail address: .....  
Total number of surveyors: .....

Date of survey: ...../...../..... (d/m/y)  
Start time of the survey: .....  
End time of the survey: .....

### Additional Information

When was the beach last cleaned: ...../...../..... (d/m/y)  
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:  Yes  No If so, how many:  
Please describe the animal, or note the species name if known: .....  
 Alive  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/nourishment of the beach or other, difficulties in identifying items due to the presence of large amounts of wood washed ashore, etc.).

Please specify: .....

Were there any events that led to unusual types and/or amounts of litter on the beach? (For example beach party or other)

Please specify: .....



ARTIFICIAL POLYMER MATERIALS			
Code	Items name	Item counts	Total
G1	4/6-pack yokes, six-pack rings		
G3	Shopping bags, incl. pieces		
G4	Small plastic bags, e.g. freezer bags, including pieces		
G5	Plastic bag collective roll; what remains from rip-off plastic bags		
G7	Drink bottles <=0.5l		
G8	Drink bottles >0.5l		
G9	Cleaner/cleanser bottles & containers		
G10	Food containers incl. fast food containers		
G11	Beach use related cosmetic bottles and containers, e.g. Sunblocks		
G12	Other cosmetics bottles & containers		
G13	Other bottles & containers (drums)		
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 from drinks		
G22	Plastic caps/lids from chemicals, detergents (non-food)		
G23	Plastic caps/lids unidentified		
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 feed bags		
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	Fiberglass/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-boxes		
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 bags		
G102	Flip-flops		
G124	Other plastic/polystyrene items (identifiable)		
		<b>Total weight (kg)</b>	

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

CLOTH/TEXTILE			
Code	Items name	Item counts	Total
G137	Clothing / rags (clothes, 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)		
		<b>Total weight (kg)</b>	

PAPER/CARDBOARD			
Code	Items name	Item counts	Total
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		
		<b>Total weight (kg)</b>	

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

METAL			
G174	Aerosol/Spray cans		
G175	Cans (beverage)		
G176	Cans (food)		
G177	Foil wrappers, aluminum foil		
G178	Bottle caps, lids & pull tabs		
G179	Disposable BBQs		
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		
		<b>Total weight (kg)</b>	



GLASS/CERAMICS			
Code	Items name	Item counts	Total
G200	Bottles, including pieces		
G201	Jars, including pieces		
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		
		<b>Total weight (kg)</b>	

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