

# Measuring System for Beach Litter



## Credits

The 'Measuring System for Beach Litter' was developed by the Hague-based Stichting Nederland Schoon (The Keep Holland Tidy Foundation) and the Royal Dutch Touring Club ANWB. It is based on the publication 'Afrekenen met zwerfafval. Een werkmethode om zwerfafval te meten en aan te pakken' (CROW/NederlandSchoon, April 2003, "Let's get rid of litter, a working method to measure, avoid and eliminate it.")

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Litter in this context is understood to mean mainly personal waste physically discarded by people or left behind at places not designated for this purpose and all the various sorts of waste that end up in public places due to the indirect doings or negligence of people.

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# Summary

Litter is a problem across much of today's society. It is common, current and complex. For everyone's sake it deserves to be tackled. The measuring system presented in this publication offers an objective method of mapping the status of litter. The heart of the system is formed by a standard set of photos, which is used to determine whether a beach is 'clean' or 'dirty'. The system also differentiates between bulky and fine beach litter.

## **NEDERLANDSCHOON - KEEP HOLLAND TIDY**

The organisation NederlandSchoon is committed to preventing and fighting litter across the Netherlands. The foundation was established in 1991 by a consortium of business, government and interest groups including the national motoring support organisation the ANWB. NederlandSchoon promotes the values of a clean living environment. The litter challenge is addressed by working towards better public facilities, stimulating effective controls and encouraging sanctions against offenders. And by providing information and exerting a positive influence on all who may cause litter.

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## **ROYAL DUTCH TOURING CLUB ANWB**

The Royal Dutch Touring Club ANWB offers a wide range of services related to roadside assistance and medical and repatriation assistance abroad, legal assistance, travel, information products, insurances, selling travel related products, and many other products and services in the areas of recreation, tourism and mobility and ANWB is active in lobbying in the fields of car driving, mobility, travel and recreation.

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# Foreword

We are pleased to present the English version of the standard beach litter evaluation method. This beach litter standard has made possible the measurement of beach cleanliness without concern for what beach, what litter and who measures it. This has in turn created a stronger foundation of cooperation between the ANWB and NederlandSchoon.

We hope that this will be another step towards cleaner, litter-free beaches in the near future.



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President and CEO  
Royal Dutch Touring Club ANWB



**Marielle van Aggelen**  
Managing Director NederlandSchoon  
Keep Holland Tidy

# The system

## 1.1 INTRODUCTION

Nearly everyone is irritated by litter, but every individual has their own perception of what 'dirty' and 'clean' precisely mean. This also applies to managers of beaches. This personal interpretation process makes measuring and determining the quantity or status of litter needlessly complicated. The 'Measuring System for Beach Litter' is a system by which everyone can judge a situation according to the same standards, and thus wear the same 'glasses' as it were. The measuring system ensures objective assessment and a standard description of beach litter.

## 1.2 CLEANLINESS LEVELS

The heart of the system is formed by five cleanliness levels.

Cleanliness level	Description
A+	Very clean
A	Clean
B	Moderately clean
C	Dirty
D	Very dirty

## 1.3 IMAGES, COUNTS AND DESCRIPTIONS

In the Measuring System for Beach Litter the cleanliness levels have been laid down in images, counts and descriptions.

Traditionally there are two methods for measuring litter.

The first is based on images - the qualitative method. The second is based on actually counting the number of items of litter found - the quantitative method. Both offer advantages and drawbacks. The quantitative method provides harder data, but is labour intensive and raises questions about types of litter. The qualitative or photographic method is more closely in line with the public perception and is less labour intensive, but the comparison of images with the actual situation sometimes raises discussion.

The measuring system shown here combines the qualitative and quantitative methods thus benefiting from the strong points of both. Research has confirmed a clear relationship between the two methods and that combining them is an obvious way of benefiting from their individual advantages.

**Images** Photos have been made of all kinds of beach litter situations in the Netherlands, but in principle they also apply to other countries as beaches everywhere show strong similarities. The photos are on the CD-ROM. This Image set provides pictures with which one can measure and record the litter status of beaches anywhere.

The system also distinguishes between bulky litter and fine litter:

- Bulky litter is understood to mean litter with a height, breadth, length and/or diameter larger than or equal to 10 cm, not large household waste (which is considered to be all that larger than 50 litre plastic bags). The photos used to describe bulky litter status cover a surface area of 100 m<sup>2</sup>.
- Fine litter is understood to mean litter with a height, breadth, length and/or diameter of less than 10 cm and larger or equal to 1 cm, but excluding chewing gum. The photos used to describe fine litter cover a surface area of 1 m<sup>2</sup>.

The images on the CD are subdivided into reference images and other images. The references are used as standards of comparison. The other images are used as material to practice with the system. The reference pictures are summarised in the enclosed litter indicator.

**Counts and descriptions** Simultaneously with the photos of the different litter situations, the number of items of bulky litter in an area of 100 m<sup>2</sup> and the number of items of fine litter per 1 m<sup>2</sup> were recorded.

In this measuring system the litter counts support the pictures. The table below shows per cleanliness level the average quantity of litter per unit area. The data apply to both bulky and fine litter. With regard to bulky litter, descriptions have been added to the pictures and counts of the various litter status.

Cleanliness level		Number of units of litter per 100 m <sup>2</sup> (bulky litter) or per 1 m <sup>2</sup> (fine litter*)	Description of bulky litter
A+	Very clean	0	No visible litter.
A	Clean	1-3	At first glance no litter, but can be sometimes detected when looking closely.
B	Moderately clean	4-10	'Several' items of litter spread here and there on the beach.
C	Dirty	11-25	A significant part of the beach contains litter.
D	Very dirty	>25	Litter nearly everywhere in all shapes and sizes.



The litter indicator shows per cleanliness level an overview of the reference picture for bulky litter, fine litter and the number of units of litter per unit area.

The chosen method depends on the situation. The photos can be used to establish the cleanliness level in practice. The counts are mainly used in cases where it is unclear with which photo it corresponds. The descriptions can be used as a supplement to the information.

**Environmental and personal perception factors**

The public's general perception of quality of public spaces is not just determined by litter, but also by factors such as graffiti, the state of a beach path or duckboards, or the state of repair of litterbins. It is therefore useful to have people involved in the removal of litter fulfil an observer's function with regard to these factors. In measuring beach litter only these factors should be ignored, but in evaluating beach improvement programmes they should not.

# Measuring

To show cleanliness levels and their change with time requires measuring the amount of litter on location and at different times. To do this observers must be specially trained. And because assessing cleanliness levels on what can be a large beach is time consuming it must be assessed by sampling. So-called measuring surfaces are used to do this. For bulky litter surfaces of 100 m<sup>2</sup> are used and for fine litter surfaces of 1m<sup>2</sup>.

This chapter successively discusses preparations for actual measurements, the field-work and the assessment of the results of the fieldwork.

## 2.1 PREPARATIONS

Preparations for the fieldwork:

- Allow observers to practise with the measuring system
- Determine the measuring surfaces
- Determine the measuring days
- Determine the measuring time
- Determine the number of measuring rounds
- Compile the registration form

### Observers practice

The observers must learn to assess litter status using the Measuring System for Beach Litter. It is therefore recommended organising practice meetings, during which observers learn to award a cleanliness level to a particular litter situation.

The practice meeting begins with a presentation of the reference pictures. The Image set for beaches on the enclosed CD-ROM is used for this. This version is currently only available in Dutch, however few words are needed, so it is easily useable by everyone. Follow the instructions to use the CD-ROM (the Dutch words on the CD-ROM are shown below in quotation marks):

1. Place the CD-ROM in the PC, the CD-ROM starts automatically
2. Click on 'normbijeekkomst'
3. Click on 'beeldenset'
4. Click on 'stranden'
5. To choose pictures of bulky litter click 'grof'
6. To choose pictures of fine litter click 'fijn'

The presentation starts for both bulky and fine litter by showing the reference pictures, in order from very clean (A+) to very dirty (D).

This is followed by the other pictures on the CD-ROM for bulky and fine litter. A random sequence has been determined for the other pictures. The participants must give scores for fine and bulky litter. The participants note down the awarded scores on a form included as appendix in this manual. The meeting coordinator has their own score form, showing the code and the cleanliness level for each image. A model score form is also included as appendix.

The scores are discussed in a short debate. Experience shows that differences of opinion can occur, but that the bandwidth or range these cover is relatively limited. If necessary, the reference pictures can be shown again and the exercise with the other images can be repeated. The aim is for the observers to be able to properly distinguish between the cleanliness levels and to accurately allocate to these a litter status.

When the observers are ready, an exercise follows on a part of the beach. The observers learn to determine the measuring surfaces and the cleanliness levels on location and to establish and record areas of 100m<sup>2</sup> and 1m<sup>2</sup>.

The observers are equipped with a registration form and the litter indicator. The form is for noting down results, the indicator to enable the observers to calibrate themselves.

This manual now continues with an explanation of other preparations for the fieldwork. Part of this explanation, such as determining the measuring surfaces, can be done in the practice meeting.

#### **Determining measuring surfaces**

- Make sure you have a map of the beach.
- Mark all specific areas on the map with a different colour. For example beaches yellow, access points red and through roads blue.
- Determine the number of surfaces: in principle one measuring surface of 100 m<sup>2</sup> per hectare (10,000 m<sup>2</sup>).
- Within each type of area, assign the number of measuring surfaces by 'pricking' these on the map. Place marks on the map. On the beach, determine the exact position of the measuring surfaces.
- Number all marks made.
- In order to evaluate a beach you must select at least 20 measuring surfaces, which are proportionately divided over unpaved and paved surface areas if any.

**Measuring frequency**

- Decide the number of measuring rounds on which you want to base the measurement.
 

Explanation: This is usually a financial decision: measuring costs time and so also money. Since the litter status can show large differences over time, at least two measuring rounds should be performed per (predetermined) period. The number of measuring rounds can be further expanded as desired (for example, evaluate all measuring surfaces twice a week in four consecutive weeks).
- Decide the number of days you need to evaluate all selected measuring surfaces once. The first time you visit all measuring surfaces to evaluate them you will require a lot of time. It is estimated that one can visit, describe and evaluate around 30 measuring surfaces per day. With experience and practice, the number of measuring surfaces can increased to 50 per day.
- Decide the days on which the measurements are to be conducted.
  - Preferably on fixed days, for example as a function of the beach cleaning times.
  - If a fixed date is not possible with regard to cleaning, then measure the selected measuring surfaces on a random day and time. For the next measuring round measure the surfaces on a different day and time.
- Compile a registration form on which you have named and characterised the points from the random check. (This simplifies fieldwork: the data only need to be checked and possibly corrected).
- Reserve space on the form to note down the results and circumstances on the beach (for example, crowded or not crowded), under which the measurements are conducted.
 

Note this data will allow the observer to track similar circumstances in a follow-up measurement.
- An example of a registration form is shown as appendix (page 16).

**2.2 FIELDWORK**

To conduct the fieldwork the observer has the map, the registration form and the litter indicator.

On the beach:

- The observer examines the map with its selected measuring surfaces and wishes with regard to the measuring day and measuring time.
- The observer determines a practical route to visit all the selected points.
- At point X:
  - The observer checks the description and character of this point, as indicated on the registration form. He or she corrects the data shown if necessary.
  - The observer decides per measuring point which 100 m<sup>2</sup> of measuring surface is to be evaluated.

- The observer determines the length of the measuring surface on the basis of the breadth which he or she has chosen to reach a total surface area of 100 m<sup>2</sup>.
- The observer determines the cleanliness level per measuring surface by comparing the situation with the reference pictures for bulky litter for beaches.
- If the reference pictures are unusable due to the presence of obstacles (for example advertising boards or construction work) then the observer determines the number of units of bulky litter and the cleanliness level on the basis of the result.
- For fine litter the observer seeks out the dirtiest area of 1 m<sup>2</sup> within the area of 100 m<sup>2</sup> just measured. The observer walks to this dirtiest area looks straight down from the spot where he or she is measuring and also determines the cleanliness level. To do this the observer compares the encountered situation with the reference pictures for fine litter.
- The observer notes down the circumstances during the measurement on the registration form.
- In case of doubt or to prevent discussions about the quality of the measuring surface, the observer takes a photograph.

The following rules of thumb apply to taking photos of bulky litter which are comparable with the reference pictures:

- use a tripod at a height of around 1.65 m;
- hold the camera aiming slightly down (angle 80-85 degrees);
- make sure the air/land ratio is around 1 to 4.

The situation for fine litter can also be recorded with a photo. To take photos that are comparable with the reference pictures the photo must be taken at a right angle to the surface. The photo must cover a surface area of around 1 m<sup>2</sup>.

- The observer clearly indicates which measuring surface he or she is taking a photo of on the registration form and notes the photo number (with an analogue camera: possibly also the number of the roll of film).

### 2.3 EVALUATION

The results of the measurements are transferred from the registration form onto a spreadsheet, say Excel. To calculate the results, the evaluations are converted into scores in Excel.

**Table 3: Translating cleanliness level into a score**

Cleanliness level per measuring round	Report score
A+	10
A	8
B	6
C	4
D	2

Count the scores and subsequently divide by the number of measuring points to determine the average score per measuring round.

Example									
Measuring round 1	Evaluation Bulky litter	Score Bulky	Evaluation Fine litter	Score Fine		Evaluation Bulky litter	Score Bulky	Evaluation Fine litter	Score Fine
Measuring surface 1	A	8	C	4	Measuring surface 11	A	8	C	4
2	B	6	C	4	12	A+	10	C	4
3	C	4	C	4	13	A+	10	C	4
4	C	4	C	4	14	A+	10	B	6
5	A	8	B	6	15	A	8	B	6
6	B	6	B	6	16	A	8	B	4
7	B	6	B	6	17	A	8	B	4
8	A	8	B	6	18	B	6	B	4
9	A	8	C	4	19	A	8	B	6
10	A	8	B	6	20	C	4	C	4
Total							144	96	
Average							7,2	4,9	

These can be put in a diagram, and by counting the results of the measuring rounds the average cleanliness level over longer periods can be established. This is as follows: Combine the different measuring rounds

Example					
	Measuring rounds (in practice 12, here as example 4)				
	1	2	3	4	
Report scores bulky litter	7,2	7,9	8,4	8,5	32
<b>Total average bulky</b>					<b>8</b>
Report scores fine litter	4,9	5,1	4,8	4,9	19,7
<b>Total average fine</b>					<b>4,9</b>

Follow the next step if you want to combine the results of several areas (for example all the beaches of a city or province):

Report scores for various areas over several measuring rounds	
Beach	Score
X	8
Y	7,2
Z	7,9
<b>Average score</b>	<b>7,7</b>

# Score form 'normbijeenkomst' participants (participants intro meet)

Date: \_/\_/\_

Participant's name:

On the score form indicate the score per picture. Note down any comments.

These can be used during the debate on the problems of litter.

Picture number	Score bulky litter	Score fine litter	Comments
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

# Coordinator's Score form

Date: \_/\_/\_

Name:

This score form for the litter coordinator contains the cleanliness levels awarded to the pictures in accordance with the standardisation system. The pictures on the CD-ROM are shown in random order, with the exception of the reference pictures.

## Bulky litter

Picture number	Reference picture	Other picture	Cleanliness level
1	X		A+
2	X		A
3	X		B
4	X		C
5	X		D
6		X	D
7		X	A+
8		X	C
9		X	A+
10		X	B
11		X	A
12		X	C
13		X	B
14		X	A
15		X	B
16		X	C
17		X	A
18		X	A+
19		X	D

## Fine litter

Picture number	Reference picture	Other picture	Cleanliness level
1	X		A+
2	X		A
3	X		B
4	X		C
5	X		D
6		X	B
7		X	A
8		X	A+



# Registration form

Date:

Conducted by:

Weather conditions:

Location:

Photo no:

Comments:

Measuring point	Score bulky litter	Score fine litter
Number		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

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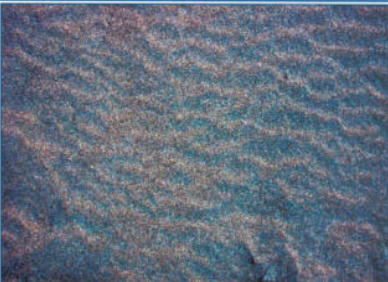








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# Beach litter indicator

Bulky litter (>10 cm)  
per 100 m<sup>2</sup>

Fine litter (<10 cm)  
per ~~100 m<sup>2</sup>~~ 1 m<sup>2</sup>

## Cleanliness level

A+		<ul style="list-style-type: none"> <li>• Very clean</li> <li>• 0 units of litter</li> <li>• No visible litter</li> </ul>		<ul style="list-style-type: none"> <li>• Very clean</li> <li>• 0 units of litter</li> </ul>
A		<ul style="list-style-type: none"> <li>• Clean</li> <li>• 1-3 units of litter</li> <li>• At first glance no litter, but it can sometimes be seen if you look closer</li> </ul>		<ul style="list-style-type: none"> <li>• Clean</li> <li>• 1-3 units of litter</li> </ul>
B		<ul style="list-style-type: none"> <li>• Moderately clean</li> <li>• 4-10 units of litter</li> <li>• Several items of litter spread here and there on the beach</li> </ul>		<ul style="list-style-type: none"> <li>• Moderately clean</li> <li>• 4-10 units of litter</li> </ul>
C		<ul style="list-style-type: none"> <li>• Dirty</li> <li>• 11-25 units of litter</li> <li>• A significant part of the beach contains litter</li> </ul>		<ul style="list-style-type: none"> <li>• Dirty</li> <li>• 11-25 units of litter</li> </ul>
D		<ul style="list-style-type: none"> <li>• Very dirty</li> <li>• &gt; 25 units of litter</li> <li>• Litter nearly everywhere in all shapes and sizes</li> </ul>		<ul style="list-style-type: none"> <li>• Very dirty</li> <li>• &gt; 25 units of litter</li> </ul>