Recreational benefits of reductions of litter in the marine environment

Final report

For Rijkswaterstaat Waterdienst

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eftec
73-75 Mortimer Street
London W1W 7SQ
tel: 44(0)2075805383
fax: 44(0)2075805385

eftec@eftec.co.uk
www.eftec.co.uk

Recreational benefits of reductions of litter in the marine environment: Final Report

This report has been prepared by:

Dr Rob Tinch (eftec)

Laurence Mathieu (eftec)

Åsa Soutukorva (Enveco)

Eduard Interwies (InterSus)

Prof. Roy Brouwer

Dr Dugald Tinch

Stefan Görlitz (InterSus)

Nina Raatikainen (Enveco)

Reviewer: Ian Dickie (eftec)

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Table of Contents

Executive Summary

This study aims to provide evidence to support the implementation of the European Marine Strategy Framework Directive in the Netherlands. Specifically, the context is the Dutch Government objective of a declining trend in the amount of litter at sea and along beaches. The study seeks to inform the assessment of the benefits to marine and coastal recreation that could arise through achieving this objective.

To find information on the costs and benefits of litter reduction, the study reviewed the literature on litter and recreation values. The search found 458 sources in 8 European languages, and 44 of these provided original evidence relevant to the study.

The largest group of studies reviewed report quite general information on attitudes. Mostly these confirm the common-sense presumption that visitors prefer clean beaches, but there is little scope for using the numerical results for valuation purposes in the Dutch case.

Evidence found for changes in beach visit frequency or location arising through reductions in litter was patchy and largely hypothetical. Transfer of numerical results to the Netherlands would not be appropriate.

Evidence on the local economic impact due to changes in litter (and associated changes in visitor numbers) was limited. While it appears clear that reductions in marine litter can lead to changes in visitor numbers and therefore visitor expenditures, there is no hard evidence that would allow estimation of the numerical impact under the Dutch policy proposals.

Of the few economic valuation studies that were found, most did not fully separate litter from other more general environmental quality issues, and this seriously reduces their suitability for value transfer to evaluation of a policy specifically focused on litter reductions. It also means that there is no real scope for meta-analysis on the specific issue of litter.

A set of recent studies by Tinch and Hanley yield a range of values from different areas (Scotland, Northern Ireland, Republic of Ireland) with slightly different characteristics. These areas are similar enough to the range of situations in the Netherlands (climatically, environmentally, economically and socially) to allow value transfer to be a reasonable proposition. These values give the most suitable evidence available for transfer to the Dutch policy evaluation.

The recommendation is to use a range of €0.60 to €1.60 per trip for the value of moving from partly littered to fully clean beaches. This should be considered alongside estimation of likely impacts of policy: if a policy of litter collection on beaches will not result in 'fully clean beaches', the values should be scaled back accordingly. The spread of values can be considered as reflecting the uncertainty in valuation and transfer, as this is an approximate method used in the absence of full data.

1. Introduction

This study aims to provide evidence to support the implementation of the European Marine Strategy Framework Directive (MSFD; EU, 2008) in the Netherlands. Specifically it aims to inform the Dutch Government objective of a declining trend in the amount of litter at sea and along beaches, and the need to assess the benefits to marine and coastal recreation that could arise through achieving this objective.

The MSFD calls for Member States to identify measures to be taken to achieve or maintain Good Environmental Status (GES) (Article 13/1), but also to "ensure that measures are cost-effective and technically feasible" by carrying out impact assessments and cost-benefit analyses (CBA) prior to the introduction of any new measure (article 13/3). In the Netherlands and other Member States around the North Sea, most of the potential management measures that could be used to deliver targets for GES under the Directives 11 descriptors are already part of other policies (such as the Water Framework Directive and Common Fisheries policy). However, this is not the case for Descriptor 10 (litter), and it is anticipated that new measures will be needed in order to achieve the objectives.

Since CBA will be required for such measures, it is important to understand the costs and benefits of litter reduction. An initial study (LEI report 2011-036) identified that increased recreation values would be by far the main benefit from reduced marine litter. Better understanding of these values is therefore key to appraising litter reduction options.

The primary objective of this study is therefore to strengthen the economic evidence base on the impacts of marine litter on recreation. To do this, the study reviews the literature on litter and recreation values, and scope the potential for conducting meta-analysis of this relationship.

It was anticipated that the body of evidence specifically relating to the value to recreation of changes in marine litter could be insufficient for formal meta-analysis. Therefore, the research also examined a broader range of knowledge, including evidence from terrestrial environments and studies on attitudes and preferences that stop short of attempts at economic valuation. In conclusion, the study scopes the best way forward for providing the information needed to inform policy development.

Following this introduction, Section 2 of the report presents some background on the policy framework and valuation of impacts on recreation. Section 3 describes the procedure followed to identify studies on litter and recreation values. The findings of the international literature review are then presented in section 4. Section 5 discusses the potential for a meta-analysis on studies exploring the value of the impacts of marine litter on recreation. Section 6 presents the conclusions.

All currency values in the report are given first as the original study value, and then in parenthesis as the Euro equivalent at 2011 prices. This requires firstly conversion to Euros, with correction for Purchasing Power Parity (PPP)[1], and then deflation using the Eurostat Harmonised Index of Consumer Prices (HICP)[2].

2. Policy background

Several international agreements and legislation are relevant to the topic of "marine litter", whether through an explicit focus on the topic (i.e. agreements specifically targeting waste discharge and reductions of marine litter), or as one topic among others aiming at a sustainable use and conservation of the marine environment. The key international agreements and legislation are briefly discussed below. Details of national and local legislation are not addressed here.

2.1 United Nations Convention on the Law of the Sea (UNCLOS) and General Assembly (GA) Resolutions, especially UN Resolution A/RES/60/30 – Oceans and the Law of the Sea

UNCLOS is a UN convention aiming at the management of marine resources. It includes various provisions, ranging from territorial sea limits and economic and commercial activities via protection, conservation and research issues to binding procedures for settling legal disputes. UNCLOS sets out the legal framework within which all activities in the oceans and seas must be carried out.

Protection and preservation issues are addressed by Part XII of the Convention (Articles 192-237), centred around pollution prevention and control of sea- and land-based activities, as well as atmospheric pollution. Marine litter was specifically mentioned in the UN General Assembly (GA), which carries out annual reviews of the law of the sea (Resolutions), based on annual comprehensive reports prepared by the Secretary-General. The GA's Resolution A/RES/60/30 – Oceans and the Law of the Sea (2005) , states:

"…The General Assembly…

65. Notes the lack of information and data on marine debris and encourages relevant national and international organisations to undertake further studies on the extent and nature of the problem, also encourages States to develop partnerships with industry and civil society to raise awareness of the extent of the impact of marine

[1] Purchasing power parity corrects for differences in price levels between countries. It is used instead of market exchange rates because it is a better reflection of true prices.

[2] Deflators correct for inflation, again to give a true reflection of values. Prior to 1996, HICP deflators are not available: deflators for the Netherlands have been used to bring older currency values to 1996 levels, then the HICP deflators to move from 1996 to 2011 values.

litter on the health and productivity of the marine environment and consequent economic loss;

66. Urges States to integrate the issue of marine debris within national strategies dealing with waste management in the coastal zone, ports and maritime industries, including recycling, reuse, reduction and disposal, and to encourage the development of appropriate economic incentives to address this issue including the development of cost recovery systems that provide an incentive to use port reception facilities and discourage ships from discharging marine debris at sea, and encourages States to cooperate regionally and sub-regionally to develop and implement joint prevention and recovery programmes for marine debris;…"

2.2 International Convention for the Prevention of Marine Pollution from Ships (1973) as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)

The MARPOL convention is the most important international agreement covering pollution of the marine environment by ships. It has six annexes, of which Annex V (a non-compulsory annex) specifically covers marine litter ('garbage'), which is defined as "*all kinds of food, domestic and operating waste, excluding fresh fish, generated during the normal operation of the vessel and liable to be disposed of continuously or periodically*".

Annex V contains regulations on types of garbage that are allowed or forbidden to be disposed, and specifications of the distances from the coast and the manner in which they may be disposed of. According to Annex V, the disposal of all kinds of garbage, excluding under certain circumstances food waste, is strictly forbidden in the North Sea (and adjacent areas), which is declared as a 'Special Area'. Other obligations include a comprehensive documentation of all waste disposed of into the marine environment (Mouat et al. 2010).

As of October 2012, MARPOL Annex V has been ratified by 144 states, which cover 98.47% of the world's shipping tonnage. Despite these high figures, the impact of MARPOL Annex V is still quite limited (Dworak et al. 2011).

2.3 EU policies

EU Marine Strategy Framework Directive (2008/56/EC)

In June 2008, the Marine Strategy Framework Directive (2008/56/EC - MSFD) was published. This Directive represents the first integrated policy for the protection of the marine environment - addressing multiple threats to the marine environment, including marine litter - and obliges the EU Member States to achieve or maintain "Good Environmental Status" (GES) in their marine environments by 2020 at the latest. GES is described by a set of 11 qualitative descriptors, of which marine litter is one. For the purpose of achieving or maintaining GES, marine strategies containing

programs of measures must be developed and implemented in order to protect and preserve the marine environment, prevent its deterioration or, where practicable, restore marine ecosystems in areas where they have been adversely affected (Mouat et al. 2010; Sterk Consulting).

GES is defined in the Directive as "*the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations*". Obviously, this description needs to be defined more clearly in order to develop quantitative targets, and this process, which is coordinated by the Common Implementation Strategy (CIS), is not yet complete. Marine litter is considered as a topic of great importance and seems to be one of the focal points of MSFD-implementation, but much necessary basic information is missing. Accordingly, the future work programme of the CIS 'Working Group GES' calls for "more expert discussions on specific topics" and "dedicated workshops", with litter being considered an obvious priority topic. Linked to this, the German government will host a conference on the topic in April 2013.

Prior to implementing measures to reach GES, the MSFD also requires the Member States to conduct Impact Assessments, including Cost-Benefit-Analyses (CBA). In this context, some form of economic consideration of (environmental) benefits of measures to improve the status of the marine environment is necessary. Consistent approaches to do so are not yet developed, although some Member States (Netherlands, Germany) have already issued reports and methodologies tentatively exploring the possibilities and constraints in evaluating the (economic) benefits of a reduction of marine litter (Dworak et al. 2011).

EU Directive on port reception facilities for ship-generated waste and cargo residues (2000/59/EC)

The EU Directive on port reception facilities for ship-generated waste and cargo residues complements the MARPOL convention, aiming at reducing illegal discharges of ship-generated waste through the provision and/or improvement of waste reception facilities in ports (mandatory for ports, and subject to controls).

According to the Polluter-Pays-Principle, all ships/shipping companies must pay a mandatory charge, contributing to the installation of the port reception facilities, irrespective of whether they use them or not. Through a non-homogenous implementation of the Directive, for example regarding common standards and designation of the port facilities, its impact is still limited.

Other EU Directives which contain provisions that affect marine litter:

Several other Directives affect the way waste can arise and potentially enter the marine environment. These include:

- Bathing Water Directive (76/160/EEC and 2006/7/EC)
- Urban Waste Water Treatment Directive (91/271/EEC and 98/15/EC)
- Environmental Liability Directive (2004/35/EC)
- Directive on Packaging and Packaging waste (2004/12/EC)
- Waste Framework Directive (2008/98/EC)

2.4 Regional Conventions - OSPAR

OSPAR, the "Convention for the Protection of the marine Environment of the North-East Atlantic", is the regional framework under which fifteen national governments of Europe, together with the European Community, cooperate to protect the marine environment of the North-East Atlantic. The convention contains a series of annexes, covering pollution prevention and elimination, and quality assessments of the marine environment. Whilst OSPAR has a remit to undertake programmes and measures on human activities, this excludes measures relating to management to fisheries, and shipping measures (which should be referred to the International Maritime Organization).

The activities of OSPAR presently concentrate more on assessment and the development of coherent methodologies to assess marine litter. The most important activities include (JRC IES 2011; Wurpel et al. 2011):

- In 2007, OSPAR launched a *Pilot Project on Monitoring Marine Beach Litter* (see OSPAR 2007) which was the first region-wide project in Europe to develop a standard methodology for monitoring marine litter found on beaches.
- In response to call for action by the UN's General Assembly in 2005, UNEP's Global Marine Litter Initiative organized and implemented regional activities on marine litter, collaborating with 11 Regional Seas organizations. In the course of these activities, and based on previous work on marine litter, OSPAR prepared a regional assessment of marine litter, the *Assessment of the Marine Litter Problem in the North-East Atlantic Maritime Area and Priorities for Response*. (OSPAR 2009).
- Based on the pilot project on monitoring marine litter on beaches, OSPAR in 2010 launched the formal *Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area* (OSPAR 2010).
- Currently, OSPAR is heavily involved in the discussions about the definition of 'Good Environmental Status' (GES) according to the EU Marine Strategy Framework Directive (MSFD), specifically the discussions regarding indicators, target setting and monitoring activities. To this end, for each MSFD descriptor (including marine litter), a 'living document' containing advice on GES is developed, to be fed into the MSFD decision making process. The document -

MSFD Advice document on Good environmental status - Descriptor 10: Marine Litter (OSPAR, 2012) - expands on OSPAR's experience in monitoring marine litter, not only on beaches, but also in the stomachs of the Northern Fulmar (*Fulmarus glacialis*).

However more consideration is now being given to the development of programmes and measures, such as the OSPAR Recommendation 2010/19 on on the reduction of marine litter through the implementation of fishing for litter initiatives. The recommendation supports the fishing industry to voluntarily collect marine litter and bring it ashore for recycling or disposal. OSPAR is also currently considering the development of a Regional Action Plan on Marine Litter action plan to support the development of further common measures (John Mouat, pers. comm.).

2.5 Other international agreements which importance for marine litter

The policy context for marine litter is further shaped by a number of international agreements with a bearing on management of the marine environment and associated human activities. These agreements include:

- London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972) and the 1996 Protocol relating thereto.
- Agenda 21: The United Nations Programme of Action from Rio and the Johannesburg Plan of Implementation.
- Convention on Biological Diversity (1992), with the Jakarta Mandate on the Conservation and Sustainable Use of Marine and Coastal Biological Diversity (1995).
- Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (UNEP, regional seas program).
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.
- FAO Code of Conduct for Responsible Fisheries.

2.6 Valuation of recreation

Development and implementation of policy requires analysis and appraisal, and often this calls for economic assessments of different scenarios, for cost-benefit analysis or other appraisal methods. As noted in the introduction, initial appraisal the Dutch marine litter objectives (LEI report 2011-036) identified that increased recreation values would be the largest benefit from reduced marine litter. Valuing the recreation improvements calls for application of economic valuation techniques.

Coastal recreation is often free at the point of delivery, but is nevertheless of great value to those who engage in it. Economic valuation of recreation seeks to derive a

demand curve for recreation activity, aiming to estimate the economic value of changes in quantity and/or quality. 'Economic' in this context does not mean 'financial' but rather signals that impacts on human welfare are being measured and expressed in monetary terms.

There are many different techniques for estimating economic values of environmental goods and services; recreation values are commonly addressed using the travel cost method or stated preference methods. Travel cost is one of the revealed preference techniques, based on detailed analysis of actual behaviour that has both environmental and market elements. Different methods exist (see Tinch et al 2010 for a discussion in the context of developing outdoor recreation value evidence): they have the common feature of using the costs incurred by individuals travelling to reach a site, in addition to costs incurred at the site, as a proxy for the price of the recreational activity. This cost information is combined with information about visitation rates/behaviour for different people or areas to derive an estimate of the value of recreation at the site.

Stated preference methods involve interviews eliciting behavioural or payment intentions under structured hypothetical situations. The main methods are contingent valuation and choice experiments. Contingent valuation respondents directly for their willingness to pay for clearly specified but hypothetical changes in the provision or quality of some environmental good or service (such as changed litter levels on a beach). Choice experiments ask respondents to choose or rank alternative scenarios, each with different levels of certain characteristics (including for example the level of litter on a beach, the water quality, the density of visitors, the cost of reaching/using the beach).

Many assessments of the "economic value" of tourism focus on contributions to local or national economies, and disregard the additional value (surplus) to the participants in recreation. These methods can be particularly important for assessing impacts on particular communities or in securing funding from organisations with a focus on economic development. They can also be useful if full economic valuation evidence is not available, or is considered unreliable. However, it should be kept in mind that expenditure-based estimates (1) do not account for the surplus benefits to individuals engaged in recreation; (2) include a (possibly large) element of true cost – i.e. the real resource cost of the expenditure (transport, food, labour…) which is not part of the gain to local communities; and (3) may include a large element of displacement from expenditures at other locations (and so may not represent improvements in national economic welfare, only local).

When estimating expenditure measures, there are several additional factors that are often taken into account. These depend on defining some boundary for the impact, often on a regional level (which may not reflect national interests).

- Multiplier effects: direct expenditure within an area will lead to additional indirect and induced spending, leading to further economic and employment

benefits. These are typically accounted for using multipliers on the basic spend.

- Displacement: where some benefit arises at the expense of a reduction in spending/employment elsewhere in the target area.
- Leakage: where part of the benefits accrue outside the target area, this may be netted out of the calculations.

In many cases, including the current context of assessing the Dutch government policy on marine litter, carrying out reliable primary valuation studies may be deemed to be too expensive or to take too long to feed in to the policy process in a timely and resource-efficient fashion. In these circumstances, value transfer techniques can be used. These involve taking one or more existing valuation studies and transferring the value estimates to a new policy context: this requires careful adjustments to take into account differences between the original study sites and contexts and the policy application context.

The objects of valuation can be changes in quality of resources (for example changes in levels of litter on beaches), or changes in quantity (for example access restrictions, beach closures), or the total value of recreation in a given geographical area for a particular type of resource or activity. The application can be to different levels of change, from marginal (e.g. incremental changes in quality) to total (e.g. total loss of access).

The level of change is partly a function of scale – the loss of access to a single beach site might be considered "total" in a very local context, but "marginal" when assessing national recreation opportunities and values – and there are issues here associated with scaling up and aggregation of values.

There are also different time profiles for valuation – sometimes the main interest is in potential future changes (for example the future impacts on recreation of reductions in marine litter due to Dutch policy changes), and sometimes in evaluation of the impacts of past interventions or environmental incidents (for example, the impact on coastal recreation values of beach closures due to an extreme litter incident, as in Ofiara et al 1999 – see discussion in section 4).

So many factors influence the valuation / policy contexts, and in each case the methods and data requirements may be slightly different. This can influence the potential to transfer evidence between contexts. The suitability of evidence for transfer to the Dutch case is therefore a key criterion considered in the literature review, below.

3. International literature review

The primary aim of the project is to review studies of the economic value of recreational benefits from reductions in marine litter, and to scope the potential for applying meta-analysis to this literature in order to derive a value for application in the Dutch context.

However, it was anticipated that there was likely to be a lack of robust economic valuation evidence in this area. Therefore, a broader review scope was required, in order to enable exploration of alternative analysis options and to support proposals for the best way forward in assessing changes in recreation values.

The literature review therefore sought to develop an extensive listing of existing research into the impact of marine litter and litter reduction on marine and coastal recreation values. This includes stated preference and revealed preference data, and also studies on actual behaviour or stated behavioural intentions that stop short of attempting economic valuation. In addition, the review encompasses broader knowledge on related topics, including public attitudes towards litter, the impact of litter on recreation values at terrestrial sites, and the impact of litter on commercial/tourism benefits to coastal economies (which are not willingness to pay measures of value, but are nevertheless often used in policy appraisal).

3.1 Development of search terms

A list of search terms was developed to ensure broad coverage of all literature relating to the key topics of interest. The first step was to develop a list of search terms in English. Four key headings were identified to capture the fundamental relationship of interest: 'litter', 'marine', 'recreation' and 'value'.

A list of associated terms was then developed under each heading, drawing on discussion and initial reviews of websites and documents to capture the range of terms used under each of the headings, and taking into account the extended scope of the review. For example, the focus of the research is on economic values, but references to impacts, preferences, attitudes and so on also yield useful information, as do references focusing on specific aspects of the litter-recreation relationship such as injuries through contact with litter.

To manage issues associated with limits to the length of search strings in certain search engines, the length was limited by using wildcards as appropriate for searching (for example 'coast*' to cover both coast and coastal), and also by subdividing the lists into 'core' and 'extended' parts.

For example, the key concept 'marine' had a core list {Marine; Sea/side; Coast/al; Beach; Ocean; Reef} and the extended list {Forest; Wood/land; River/side/bank; Countryside; Outdoor/s; Park}. The former should cover sources relating to the

marine environments of interest, while the latter allows for our extended look at effects on terrestrial recreation. The full list of search terms is shown in Table 1. Search lists were then developed for Danish, Dutch, French, German, Greek[3], Norwegian, Spanish and Swedish (see Table 2). These are broadly the same lists, but are not word-for-word translations: the individual researchers sought to cover the full range of concepts likely to be used in the literature in their languages.

Table 1: Search terms in English

LITTER	MARINE	RECREATION	VALUE
Key concepts	**Key concepts**	**Key concepts**	**Key concepts**
Litter	**Marine**	**Recreation/al**	**Value**
Waste	Sea/side	Visits/Visitations	Impact
Rubbish	Coast/al	Trips/Trip Number	Beach closure
Garbage	Beach	Tourism/t	Economic/Economy
Trash	Ocean	Leisure	Commercial
Debris	Reef	Hotel	Expenditure
Foul/ed/ing			
Extended list	**Extended list**	**Extended list**	**Extended list**
Beach cleaning	Forest	Boat/ing	Preferences
Flotsam	Wood/land	Angling, fishing	Attitudes
Jetsam	River/side/bank	Swim/ming	Satisfaction
Effluent	Countryside	Kite/Surfing	Enjoyment
	Outdoor/s	Kayak/ing, canoe/ing	Behaviour
	Park	Birdwatching	Injury
		Walk/ing	Health
		Picnic	
		Cycling	

[3] Key concepts only: there were no useful results at all with these terms, suggesting that there would be little to be gained from searching more widely in Greek.

Table 2: Search terms in other languages

Language	Litter terms	Marine terms	Recreation terms	Value terms
French	Déchets Détritus Ordures Décombres *Immondices* *Cochonneries* *Nettoyage/ nettoyé* *Epave* *Nuisances*	Marin Mer/bord de mer Côte/côtier/côtière Plage Océan Récif/corail/corallien/coraux *Forêt* *Bois* *Rivière/rive* *Campagne* *Plein air* *Jardin public* *Parc*	Récréationnel/le Usagers Sortie Excursion Tourisme/touriste Visite Loisir Hôtel *Navigation Pêche* *Baignade* *Kitesurf* *Kayak* *Canoë* *Promenade/ marche* *Piquenique* *Vélo/bicyclette* *Observer les oiseaux*	Valeur/évaluation/évaluer Impact Fermeture des plages Economique/ Economie Commerciale Dépenses *Préférences* *Attitude* *Satisfaction* *Comportement* *Blessures* *Santé*
Spanish	Desechos Basura Detritos Desperdicio Escombro Residuos *Limpieza de playas* *Pecio* *echazón* *Efluente*	Marino/a Mar Costa/ero Playa Océano Arrecife Litoral *Bosque* *Ribera* *Orilla* *Campo* *Parque*	Recreativo Visitas Viaje Turismo/Turista Ocio Hotel *Barco* *Navegación* *Pesca* *Baños* *Nadar* *Kitesurf* *Kayak* *Piragüismo* *Observación de aves* *Pasear* *Picnic* *Ciclismo*	Valor/evaluación/evaluar Impacto Cierre de playas Económico / economía Comercial Gasto *Preferencias* *Actitudes* *Satisfacción* *Disfrute* *Comportamiento* *Lesión* *Salud*
German	Abfall Müll Schrott Verschmutzung	Marine Meer/es- Strand Küste/n Riff Ozean	Erholung/-s Besuche Übernachtungen Anzahl Übernachtungen Freizeit Hotel Tourismus	Wert Auswirkungen auswirken Ökonomie Strand-/Schließung Einnahmen

	Strandreinigung *Treibgut* *Strandgut* *Schmutzwasser*	*Wald* *Forst* *Fluss/-ufer* *Land* *Outdoor* *Park*	*Boot fahren* *Angeln* *Schwimmen* *Surfen* *Kayak, Kanu* *Vögel beobachten* *Wandern* *Picknick* *Radfahren*	*Präferenzen* *Einstellung* *Zufriedenheit* *Genuss* *Verhalten* *Verletzung* *Gesundheit*
Norwegian	Søppel Forsøpling Skrap Avfall Sopor Forurensing *Rydde* *Vrakgods* *Strandfunn* *Avløp* *Rydde* *Vrakgods* *Strandfunn* *Avløp*	Marin Hav Kyst Strand Strender *Skog* *Elv* *Park* *Friluft*	Rekreasjon Besøk Reise Turisme Fritid Hotell *Båt* *Seile* *Fiske* *Svømme* *Bade* *Surfe* *Padle* *Kajakk* *Kano* *Fugl* *Promenere* *Gåtur* *Vandre* *Piknik* *Sykle*	Verdi Vurdering Effekt Påvirkning Økonomisk Kommersiell Utgift Kostnad *Preferans* *Attityd* *Tilfredsstillelse* *Nytte* *Førnøyelse* *Atferd* *Skade* *Helse*
Danish	Affald Forurening Biks Skrald Supper *Oprydning* *Rydde* *Rensning* *Bortskaffelse* *Vraggods* *Strandfund* *Afløb*	Marin Hav Kyst Strand *Skov* *Flod* *Park* *Friluft*	Rekreation Besøg Rejse Turisme Fritid Hotel *Båd* *Fiske* *Sejl* *Svømme* *Surf* *Padle* *Kajak* *Kano* *Fugle* *Spadseretur* *Gåture* *Vandring* *Picnic* *Cykla*	Værdi Effekt Påvirkning Økonomisk Kommerciel Udgift Omkostning *Præference* *Attitude* *Tilfredsstillelse* *Nytte* *Fornøjelse* *Adfærd* *Beskadige* *Sundhed*

Swedish	Skräp Avfall Sopor Förorening *Städning* *Rensning* *Vrakgods* *Strandfynd* *Avlopp*	Marin Hav Kust Strand Stränder Bad *Skog* *Älv* *Landsbygd* *Park* *Friluft*	Rekreation Besök Resa Turism/t Fritid Hotell *Båt* *Segla* *Fiska* *Simma* *Bada* *Surfa* *Paddla* *Kanot* *Kayak* *Fågel* *Promenera* *Vandra* *Picknick* *Cykla*	Värdering Effekt Påverkan Samhällsekonomisk Ekonomisk Kommersiell Utgifter Kostnader *Preferens* *Attityd* *Tillfredsställelse* *Nytta* *Nöje* *Beteende* *Skada* *Hälsa*
Dutch	Zwerfafval Plastic *Reiniging* *Microplastics* *Plastic soep*	Kust Strand Noordzee *Ecosysteem degradatie* *Belang Noordzee*	Toerisme Recreatie Bezoekers Visserij *Plastic in netten* *Plastic in dieren*	Economsiche waarde Gedrag Belevingswaarde *Kosten* *Baten* *Uitgaven gemeenten opruimen stranden*
Greek	σκουπίδια Απόβλητα Ρύπανση	θαλάσσιο θάλασσα ακτή Παραλία/ παράκτιο ωκεανός ύφαλος	αναψυχή Επισκέψεις Ταξίδια τουρισμός ελεύθερος χρόνος ξενοδοχείο	αξία επιπτώσεις κλείσιμο παραλίας Οικονομία εμπορικό δαπάνη

Literature searching was carried out using Google, Google Scholar, and Yandex; initially, Bing! was also used, but this did not provide additional useful references since most of the results were commercial links. Specialised databases were also searched, including the EVRI database (De Civita et al., n.d.), the Recreation Use Values Database for North America (OSU, 2012), and the TEEB Valuation Database (Van der Ploeg and de Groot, 2010).

Seventeen individuals and organisations to consult were also identified, contacted initially by email and followed up by telephone where necessary. This took place after

the initial literature searching and resulted in only 4 new sources being identified. These were added to the database.

3.2 Recording results

The results were recorded in a simple bibliographic database[4]. Each reference was coded by language and a 3-digit reference number (e.g. EN001...EN231, for the English sources). Duplicate hits (identical source) were not recorded during searching, though the database does include a few (semi-) duplicates: cases include sources produced in two or more languages, 'grey' and peer-reviewed versions of the same research, websites presenting review or press release material for a study included in the database. In these cases, we only reviewed the most relevant source, but kept the reference in the database, with a flag and note that it partly or totally duplicates another entry, since for meta-analysis, or other methods of transferring results, duplicate entries should not be treated as independent data points.

Each entry in the database includes basic bibliographic information (citation, web-link and so on) followed by a series of "yes/no" questions regarding the content of the source:

- Links litter to visitor health/injury?
- Links litter to visitor expenditure?
- Links litter to visitor/trip numbers?
- Stated preference values for litter?
- Revealed preference values for litter?
- Reports attitudes towards litter?
- Reports policy approval for litter?
- *Links recreation to litter generation?*
- *Reports amounts/types of litter?*

A "yes" answer to any of the first seven questions resulted in the study being flagged for a full review. In some cases, this was not actually carried out (if the information presented was very brief, anecdotal, or made reference only to other studies already included in the review) and a note was added to explain this. A "yes" answer to either of the final two questions (in italics) did not lead to a full review, because this information does not help directly with valuing the impact of litter on recreation values. These studies have been retained in the database as they might be helpful for future work.

In a full review, further information was recorded regarding the type of environment, type of recreation, type of litter and type of impact, as well as the scale and similarity to the Netherlands (see Table 3). Each value estimate was recorded using details on the method, object of valuation, sampled population and results (see Table 4). As can

[4] See separate Excel files: there is one file for each language.

be seen from the table, 'value estimate' was considered in a broad sense and includes not only economic values, but also quantitative results from attitude surveys, statements of behavioural intentions and so on. In the few cases for which multiple value estimates were available (for example attitude survey evidence and economic value evidence), separate versions of the table were completed.

Table 3: General information recorded for a full review.

Variable	Possible values
Environment type (general)	Marine general; Coastal; Non-marine; General (marine and other); Specific marine type(s); Specific general type(s)
Environment type (specific, if applicable)	*Open sea; Beach; Coast; Reef; Intertidal; Rocks; Cliffs; Forest; Woodland; River; Lake; Countryside; Park; Outdoors; Other*
Litter type (general)	General litter; Marine litter; Specific litter type(s)
Litter type (specific, if applicable)	*Plastic; Metal; Glass; Wood (processed); Paper/cardboard; Rubber; Textiles; Sewage Related Debris*
Recreation type (general)	Marine/beach recreation; Visits to coastal areas; Terrestrial recreation; General recreation; Specific type
Recreation type (specific, if applicable)	Beach visit; Boating; Angling, fishing; Swimming; Surfing, kite-surfing; Kayaking, canoeing; Bird watching; Walking, dog-walking; Picnic; Cycling; Other (specify in notes)
Impact type (general)	Trip numbers; Value per trip; Expenditure/Commercial; Other; Mixed
Impact type (specific, if applicable)	Trip numbers; Value per trip; Expenditure per trip; Local economy; Attitudes; Satisfaction/Enjoyment; Behavioural intentions; Injury/health; Beach closures; Other (specify in "Notes column")
Scale	Global; Regional; National; Multi-site; Single-site; Other (specify)
Continent	Global; Europe; N America; S America; Asia; Australia/NZ
Similarity to the Netherlands	Focus on Netherlands; Includes Netherlands case; Cases similar to Netherlands; No cases similar to Netherlands

Table 4: Value estimate information recorded for a full review	
Variable	**Possible values**
Method	Expenditure; Profit; SP: contingent; SP: choice; SP: ranking; RP: travel cost; RP: hedonic; Volunteer time; Cost of clean-up; Survey (attitudes etc); Focus groups etc; Other (specify)
Object of valuation/question	Free text
Location	Free text
Sample size	Free text – a number.
Sample population	Free text – the population from which the sample drawn (e.g. 'beach visitors during summer season')
Currency unit	Three-letter code for currency
Currency Year	The reference year for the values – if not stated, year of publication used.
Valuation unit	per person; per household; per business; per hectare; per km; other (specify)
Valuation period	per year; per trip; per day/night; present value / lump sum; other (specify)
Central estimate	Free text – the mean or median estimate reported in the study
Range/confidence interval	Free text – the range or confidence interval, if reported in the study
Further details	Free text
Suitable for transfer to Netherlands?	Yes, directly; Yes, after adjustment for income/PPP; Yes, after adjustment for context, population, income; Limited use; Not useful

4. Results

Table 5 shows the breakdown of sources found in the literature search. The searching produced 451 original sources: this includes those identified from the original web-searching and also additional references located through studies reviewed and individuals contacted. Of these, 44 presented evidence worthy of a full review.

Table 5: Summary of literature search results

Language	EN	FR	ES	NL	DE	NO	DK	SE	Total
Original sources	**232**	**74**	**33**	**7**	**53**	**13**	**30**	**16**	**458**
Full reviews	**30**	**4**	**6**	**0**	**2**	**0**	**1**	**1**	**44**
Economic valuation	*11*		*0*	*0*	*0*	*0*	*0*	*0*	*11*
Expenditure / economic impact	*5*	*0*	*0*	*0*	*1*	*0*		*0*	*06*
Behavioural intentions	*6*		*2*					*1*	*9*
Attitudes and preferences	*8*	*4*	*4*	*0*	*1*	*0*	*1*	*0*	*18*
Short reviews	**155**	**30**	**6**	**7**	**10**	**8**	**8**	**9**	**233**
Brief/anecdotal evidence	*90*	*30*	*5*	*4*	*2*	*3*	*8*	*7*	*149*
No link from litter-recreation	*65*	*0*	*1*	*3*	*8*	*5*	*0*	*2*	*84*
No evidence	**47**	**40**	**21**	**0**	**41**	**5**	**21**	**6**	**181**

The studies selected for full reviews presented relevant information of some sort on the key "litter ➔ recreation value" relationship of interest. In a few cases this was evidence on some measure of economic value: these studies are discussed in section 4.1. In some others, evidence is presented on expenditure or the impact on visitor economies: these are discussed in section 4.2.

No studies were found that directly assessed impacts on actual visit numbers following changes in litter conditions – this would require 'before' and 'after' surveying, or comparison of sites that differ in litter levels but are otherwise similar, and no such studies were found. However, some studies did address 'hypothetical' behaviour, i.e. statements about behavioural intentions under changed conditions – for example, the level of litter presence at which a respondent would stop visiting an area, or the anticipated change in visit frequency if litter were cleaned up. And some presented evidence on reported determinants of visit choices – i.e. the factors that respondents state were/are important in selecting their visit destinations. These studies are discussed in section 4.3.

The majority of studies reviewed, however, gave evidence on attitudes or preferences towards litter without explaining these in terms of economic values, economic consequences or behavioural intentions. These studies are discussed in more detail in section 4.4.

Each of the sections 4.1 to 4.4 starts with a short summary of the type of evidence included in the section, and concludes with a summary of the potential for transfer to the Dutch policy context. In between, the sources are discussed individually or in small groups of similar studies, and for each a short assessment of the suitability for transfer to the Dutch context is presented in bold.

The 'short review' studies were those that seemed likely to be relevant during initial literature searching, but which turned out on closer inspection not to include primary data on the topics of interest. Some of these did include some relevant information, but had nothing new on the litter/recreation link: only references to other estimates from primary sources. These primary sources were either already included in the database, or were added to it following the 'short review'. The remainder of the studies gave information relevant to the general area of investigation, relating to the amount of litter, ecological impacts, and so on, but did not make any reference to a link between litter and recreation values, or gave only anecdotal mention that such a link must exist.

4.1 Economic valuation studies

The ideal evidence for inclusion in CBA comes from studies using economic valuation methods to estimate all or part of the 'total economic value' of a change in some good or service – in this case, the change in the value of recreation arising from changes in levels of marine litter. A number of economic valuation studies were identified in the review (see Table 6). Although most of these turn out to be of limited use regarding transfer to the policy context (Dutch policy on marine litter), one recent set of studies (Tinch and Hanley, in press) appears promising.

Table 6: Studies reporting economic valuation evidence

Reference	Title
Beharry-Borg and Scarpa (2009)	Valuing Quality Changes in Caribbean Coastal Waters for Heterogeneous Beach Visitors
Blakemore et al (2008)	British Tourists' Valuation of a Turkish Beach Using Contingent Valuation and Travel Cost Methods
Bockstael et al (1999)	Measuring the benefits of improvements in water quality: The Chesapeake Bay

Li et al (2011)	Using MCMC Probit Model to Value Coastal Beach Quality Improvement
Marin et al (2009)	Users' Perception Analysis for sustainable beach management in Italy
Östberg et al (2010)	Non-market valuation of the coastal environment – uniting political aims, ecological and economic knowledge
Prayaga et al (nd)	Estimating the value of beach recreation in the Great Barrier Reef Marine Park, Australia: A pooled revealed preference and contingent behaviour model
Sarraf et al (2004)	Cost of Environmental Degradation: The Case of Lebanon and Tunisia
Smith et al (1997)	Marine Debris, Beach Quality, and Non-Market Values
Strand et al. (1986)	Chesapeake Bay water quality and public beach use in Maryland
Tinch and Hanley (2012-2013)	The value of changes to the bathing water directive in Northern Ireland. University of Stirling, and other work in press.

Many studies look at beach or water quality in general, and therefore can not be used directly as evidence specifically relating to litter. For example:

- **Strand et al. (1986)** used actual behaviour of recreational users to estimate the net economic value of water quality improvements per user for beach use. Estimates ranged from $6.91±$10.67/yr (€11.84± €18.29 in 2011) based upon a discrete choice model that held trips fixed, and $18±$43.41/yr (€30.85± €74.40 in 2011) based on a pooled model that allowed trips to vary.

- **Bockstael et al (1999)** study the benefits of improvements in water quality in The Chesapeake Bay. 57% of respondents found the water quality unacceptable in the Bay. 65% of those individuals were willing to pay (WTP) an amount in extra state or federal taxes per year up to $20 (€34 in 2011) if it were made acceptable for swimming. 54% were WTP between $25 and $35 (€43 and €60 in 2011) and 49% between $40 and $50 a year (€69 and €86 in 2011). 43 % of users in 1984 were WTP an average of $121 (€207 in 2011) in tax increase to make the Bay "Acceptable" (mean WTP), and 57% of non users are WTP $38. (€65 in 2011).

These studies relate to general water quality and do not explicitly mention litter, and so can not be used for transfer to a context that is specifically focused on marine litter.

Some other studies do mention litter, but bundle it up with other quality factors.

- **Li et al (2011)** look at coastal beach quality improvement in Dalian, north-eastern China at four major tourism sites (Tiger Beach Park, Fujiaz-huang Bathing Beach, Xinghai Square Beach, and Xing-hai Park) and estimate RMB¥168 (€37.27 in 2011) per person for a 15 day stay. The authors note that "Beach conditions such as slope, width, mud, debris, congestion etc. are easily observable and perceptively recognized by the tourists through photos presented to them". However, there are no details given on the 'debris' element of these photographs, and there is no way to separate out the respondents' responses specifically to variations in levels of 'debris' from their responses to variations in all the other features represented in the photographs.

- **Beharry-Borg and Scarpa (2009)** look at coastal water quality for snorkellers in Trinidad and Tobago; plastics are noted as part of the issue, but, again, it is not possible to separate litter from the general quality.

- **Sarraf et al (2004)** note the additional travel costs (vehicle cost and time) estimated at US $21 (€21.91 in 2011) per day per visitor for Lebanese beach recreation, with coastal zone degradation and pollution damaging areas especially around Beirut and Jounieh, whose populations travel to other beach areas that are not (or are less) degraded and polluted. Again, it is not possible to unpick the role of litter from the 'general quality' context.

- **Marin et al (in press)** report that 385 of 528 respondents on the Riviera del Beigua, Italy state that litter is a disturbance factor, and 36% of both visitors and locals state they would be willing to pay for an improvement in beach quality. However, litter is not drawn out from other factors and no monetary value is derived – just a statement of attitude that they would be willing to pay some non-specified amount.

Because it is not possible to determine what proportion of values relates to changes in litter, none of these studies can be used for transfer to the Netherlands litter case. They are not particularly suitable for transfer even for the context of general environmental quality on Dutch beaches, since the source studies have environmental, social and economic contexts very different from the Netherlands.

Some studies focus on values held by foreign tourists.

- **Blakemore et al (2008)** report contingent valuation and travel cost estimates for environmental quality for British tourists using a Turkish beach. The contingent valuation estimate is £1.03 (€1.34 in 2011) per adult willing to pay, or £0.90 (€1.17 in 2011) per adult overall. The 'better quality' variable used

can not be directly expressed in terms of marine litter, although 41% of respondents stated that litter was their major dislike at the beach, and a further 24% mentioned dog fouling. So it is clear that at least part of the expressed willingness to pay relates to a wish for reduced levels of litter.

- **Sarraf et al (2004)** report a study of 247 tourists to Tunisian beaches that found 17% were willing to pay to improve the cleanliness of beaches – this is more than were willing to pay to improve water quality (5%) or to reduce congestion (12%). The average WTP for these people was €18 (€23.19 in 2011) per stay (slightly lower than the figures for water quality, €20 (€25.77 in 2011), and congestion, €24 (€30.92 in 2011), though the sample sizes are small).

These studies do support the general argument that visitors/tourists are willing to pay something for cleaner beaches, and this conclusion is transferable to the Netherlands. However, it would not be appropriate to use these results to estimate the numerical value for local/national visitors to Dutch beaches. A case could perhaps be made for using the results to value impacts for foreign tourists, but the style of beach recreation is likely to be very different between Turkey/Tunisia and the Netherlands, and this might be expected to influence expressed values.

Prayaga et al (n.d.) present travel cost and stated preference evidence for the value of beach recreation in the Great Barrier Reef Marine Park. The travel cost study does not include a litter variable. However the stated preference model includes a cleanliness variable. Respondents were asked about changes in frequency of their visits and about the absolute anticipated number of visits under changed conditions at the beaches. Most respondents could answer the first part (more often/same/less often) but could not say exactly how often they would visit. The coefficient on the 'CLEANDUM' cleanliness variable was insignificant for all three groups of respondents (locals, nearby city, tourists) though this appears to be influenced by multicollinearity[5] problems with another variable and so does not imply that cleanliness is irrelevant.

The study also estimates the value to visitors of a 1% change in the cleanliness variable: $2.84 (€2.27 in 2011) to $7.37 (€5.88 in 2011) (locals); -$119.19 (€95.16 in 2011) to $99.00 (€79.04 in 2011) (nearby city); -$0.92 (€0.73 in 2011) to -$0.17 (€0.14 in 2011) (tourists). These numbers appear to be rather high, especially considering the travel cost estimates for total surplus for a single trip (about $10 (€8 in 2011) for local heavy users, $14 (€11 in 2011) for light users, $35 (€28 in 2011) for tourists).

[5] Multicollinearity refers to a situation in which two (or more) variables are quite strongly linearly correlated, with the result that it becomes difficult for statistical techniques to distinguish which of the variables is driving an effect. This means that the estimated coefficients have higher errors and correspondingly lower significance values, but this is a statistical problem: often, it is not an indication that the variables have no influence, but rather that it is not possible to separate out the influences with the data available.

It is notable that the model gives a very wide range for nearby city residents (highly negative to highly positive) and suggests cleanliness reduces value for tourists (which seems unlikely in reality). It may be that the cleanliness variable is picking up some other influence, or that there are other econometric problems with the model. Furthermore, it is not clear what the cleanliness variable is, exactly. Overall, therefore, due to problems in the specification of the valuation model, these results do not seem suitable for transfer to the Netherlands.

Östberg et al (2010) use the contingent valuation method to estimate the value of improving water quality status according to classifications in terms of ecological indicators. A web-based survey was conducted in two study areas on the Swedish East and West coasts. The mean monthly household WTP[6] between the years 2010-2029 is estimated to be 61-108 SEK (€5.69-10.08 in 2011) for improved water quality, 54-84 SEK (€5.04-7.84 in 2011) for less algal blooms and 32-50 SEK (€2.99-4.67 in 2011) for less noise and littering (see Table 7 for the noise/littering figures). For noise and littering, the status quo was defined as 'no specific policy action is taken against the problems' and the policy option was introduction of three protected areas in certain parts of the study areas.

Respondents are less willing to pay for less noise and littering than for the other improvements proposed (i.e. improved water quality, fewer algal blooms). Also, there is also a tendency for the share of protest answers to be higher regarding less noise and littering, compared to the other scenarios. The authors suggest this might indicate that this is a sensitive issue.

The authors conclude that the respondents from the East coast region express relatively high mean WTP values compared to the respondents on the West coast for all scenarios. Although the two areas are similar in many ways, including use, environmental problems and characteristics of the populations, point estimate benefit transfer involves significant transfer errors – that is, the value estimated for one group/context is quite different from the value estimated for another group/context. For example, the East coast, local WTP is SEK 50 (€4.67 in 2011), while that for West coast, non-local is SEK 32 (€2.99 in 2011), so using the first value in lieu of the second implies an error of 56%, calculated as (50-32)/32.

However, for the specific case of litter and noise, the transfer errors appear relatively modest, especially for transfer between the regions (East, West) where the errors are in the range 14%-25%; there is more error in transfer between groups (local, non-local) (see Table 8). Errors in this range seem acceptable, given the overall uncertainties in assessment.

[6] Note that the euro equivalents here are lower than those presented in the original source – this is because the source converted at market exchange rates, whereas here conversion is at purchasing power parity: this takes into account the fact that the general price level is higher in Sweden than in the euro-zone.

Overall, the results do not pose a serious challenge to the principle of transferring results to the Netherlands – clearly, this is a very approximate procedure, and the results confirm this, but do not suggest the errors are so large as to render the transfer meaningless. However, the actual results here are not especially suitable for transfer – they combine noise and litter in a single 'issue', and use a policy scenario of protected areas that does not fit well with possible litter reduction options for the Netherlands.

Table 7: Mean Willingness to Pay for less noise / littering, from Östberg et al (2010)

Region	Group	Mean Willingness to Pay (SEK)
East coast	Local*	49.89 (38.52-61.27) (€4.66 (3.60-5.72) in 2011)
	Non-local*	39.88 (31.57-48.20) (€3.72 (2.95-4.50) in 2011)
West coast	Local	43.04 (31.99-54.08) (€4.02 (2.99-5.05) in 2011)
	Non-local**	32.44 (23.51-41.37) (€3.03 (2.19-3.86) in 2011)

95 percent confidence interval is presented within brackets
* One "extreme" observation is excluded from the analysis.
** Two "extreme" observations are excluded from the analysis.

Table 8: Transfer errors for less noise and littering, from Östberg et al (2010)

			Study site			
			East coast		*West coast*	
			Local	Non-local	Local	Non-local
		Mean WTP (SEK)	50 (€4.67 in 2011)	40 (€3.73 in 2011)	43 (€4.01 in 2011)	32 (€2.99 in 2011)
Policy site	East coast	Local	-	20%	14%	36%
		Non-local	25%	-	8%	20%
	West coast	Local	16%	7%	-	26%
		Non-local	56%	25%	34%	-

Smith et al (1997) present a rare study explicitly seeking to derive economic values for beach litter management, in New Jersey and North Carolina. They use contingent valuation for scenarios based on four photographs representing different baselines, moving to a beach with no litter. The results are presented in Table 9. They show

that willingness to pay is dependent on the baseline presented, which concords with economic theory and common sense, and is reassuring for the method.

Table 9: Contingent valuation results from Smith et al 1997

Photo	Description	Sample	WTP per person per year (date of survey: 1992)
A	Mixture of man made trash with a tent	108	$72 ($34-$153) €96 (€46-€205) in 2011
B	Littered beach with unique metal debris in the background	75	$41 ($12-$143) €55 (€16-€191) in 2011
C	Three people with binoculars standing in kelp with plastic bottles	99	$63 ($30-$135) €84 (€40-€180) in 2011
D	Dense kelp with birds nearby	66	$21 ($6-$80) €28 (€8-€107) in 2011

There is limited scope for transfer to Netherlands: notably, the photos are not provided, so it is not possible to compare with actual litter situations in the Netherlands; the numbers of respondents viewing each photograph are small (see the table: though the total sample size is reasonable); and the original study took place 20 years ago.

Recent work by **Dugald Tinch and Nick Hanley (University of Stirling, 2012-2013)** provides the most useful source of potential value transfer results. In 2011 data was collected from individuals visiting beaches in the UK and Eire (the Republic of Ireland) in order to identify preferences for beach management and the 2015 Revised Bathing Water Directive (rBWD). The sample covered Northern England, Scotland, Northern Ireland and the Republic of Ireland – all areas with relatively clean water and beaches on the whole. The methodology adopted was a choice experiment with a payment vehicle of the additional cost per trip of reaching a beach with a particular set of attributes. A non-tax payment vehicle was adopted due to the range of taxation regimes in the countries considered and the ability for it to be an entirely inclusive payment alternative. Within the Irish sample only active recreational users (those entering the water) were sampled, the other country samples included non-active recreational users (those not entering the water). The attributes considered were management of beach litter and debris, health risks of entering the water and the benthic health of the coastal environment. Finally a sample of the general public in Scotland was taken via a postal survey, in this case water rates were used as a payment vehicle as this was applicable to non-use value and was relevant given the sample.

Table 10: Results of UK and Eire choice experiments

Willingness to pay	Northern Ireland	Republic of Ireland	Scotland: Onsite	Scotland: Gen. Public
Benthic Health – small increase	**£4.67*** (±£1.03)** (€5.66) **(±€1.25)**	**€4.77*** **	£6.77*** (€8.20)	£23.84*** (€28.87)
Benthic Health – large increase	**£5.97*** (±£1.03)** (€7.23) **(±€1.25)**	**€4.84*** **	£12.00*** (€14.53)	£29.32*** (€35.51)
Health Risk 5%	**£5.36*** (±£1.42)** (€6.49) **(±€1.72)**	**€4.08*** **	£13.13*** (€15.90)	£30.38*** (€36.79)
Health Risk – very little	**£7.22*** (±£1.31)** (€8.74) **(±€1.59)**	**€9.03*** **	£15.72*** (€19.04)	£54.09*** (€65.51)
Debris – Prevention (A)	**£7.37*** (±£1.01)** (€8.93) **(±€1.22)**	**€6.60*** **	£9.91*** (€12)	£52.97*** (€64.15)
Debris – Collection & Prevention (B)	**£8.72*** (±£1.19)** (€10.56) **(±€1.44)**	**€7.20*** **	£13.19*** (€15.97)	£65.36*** (€79.16)
Collection only (B-A)	**£1.35** (€1.64)	**€0.60**	£3.28 (€3.97)	£12.39 (€15.01)

Note *** = significant at the 1% level. 'Collection only' row: own calculations based on results in Tinch and Hanley.

It should be noted that there are different payment vehicles used in different parts of this study. The Scotland General Public study uses an increase in annual water rates (bills), thereby covering on both use and non-use values associated with the marine environment. The three other countries' on-site studies consider the additional cost of visiting a beach, focusing on the use-value associated with recreation.

Results are relatively consistent across groups in terms of the relative scales of the parameter values. Willingness to pay values are relatively lower in the Republic of Ireland, perhaps unsurprisingly given the economic conditions in the country at the time of the survey. Scottish on-site values are relatively higher than the Northern Irish values. However, these Scottish values were for a specific subsample (those surfing or kite surfing on the day), and when compared to the same subsample in the Northern Irish sample, results are similar.

The specific debris scenarios are 'prevention', which would reduce the levels of sewage related waste and prevent fly tipping, and 'collection and prevention', which also includes collection of general waste from the beach. **Therefore, a conservative assumption for transfer to the Netherlands would be that the *additional* WTP for collection relates to the WTP for moving from a somewhat littered situation to a**

litter-free situation, focusing specifically on beach litter, and excluding WTP for reductions in sewage related debris (which are not part of the policy proposals considered in this study). It is conservative because some part of the WTP for debris prevention will also relate to reducing beach litter.

The values from the study could be used to give a range (low-high) of values for the Netherlands. Alternatively, it would be possible to select the most closely related studies for transfer to specific areas of the Netherlands, or specific activities. Northern Ireland is relatively (compared to the other areas sampled) densely populated whilst the Republic of Ireland sample focused on the Western Coast around Galway, which is less densely populated. This suggests that the results most suitable for transfer to the Netherlands are the samples for Northern Ireland for more densely populated areas in the South of the Netherlands, and the Republic of Ireland sample for the less populated Northern areas. The analysis for Scottish surfers and kite surfers (Scotland onsite) were conducted in two towns (Ayr and Peterhead) and could be used for those engaged in active (in-water) recreation on Dutch beaches.

Summary for the Dutch situation

Relatively few economic valuation studies were found in the literature review. Most that were found did not fully separate litter from other more general environmental quality issues, and this seriously reduces their suitability for transfer to evaluation of a policy specifically focused on litter reductions. It also means – as discussed further below – that there is no real scope for meta-analysis on this issue.

The most recent studies, by Tinch and Hanley, have been designed to allow separate consideration of litter ('debris'). These studies yield a range of values from different areas (Scotland, Northern Ireland, Republic of Ireland) with slightly different characteristics that, across the range, could be considered as reasonably close to the range of situations in the Netherlands, both climatically and in terms of populations. Within the limitations of the methods, and accepting the uncertainties, transfer of these values to the Dutch context would appear reasonably justified as a first approximation.

To be conservative, the value for litter collection only (calculated as the value for 'collection and prevention' minus the value for 'prevention') should be used. The value for the Republic of Ireland is €0.60 per trip, while that for Northern Ireland is £1.35 (€1.64 in 2011). One option would be to attempt to determine similarity between areas, using the Northern Irish values for more densely populated areas and more heavily used beaches in the Netherlands. Alternatively, the figures could be used as a high-low range across the whole country.

The Scottish figures, which are higher at £3.28 (€3.97 in 2011)per trip, apply to surfers and kite-surfers, and might be used for in-water recreation trips in the

Netherlands – people who are likely to spend longer periods at the beach, in the water, and who are at more risk of injury through contact with debris.

4.2 Expenditure and economic impact

Where full economic valuation studies are not available, or where the focus is on (local) financial impacts rather than total economic welfare, evidence of changes in tourist/visitor expenditures may be used. Only a few sources in the literature review touched on the link between marine litter and visitor expenditures (see Table 11), and none are suitable for transfer directly to the Dutch policy context.

Table 11: Studies reporting expenditure and economic impact evidence

Reference	Title
Eidemüller (2011)	Müllkippe Meer
EPA 1990	Methods to Manage and Control Plastic Waste
McIlgorm et al (2008)	Understanding the economic benefits and costs of controlling marine debris in the APEC region
Mouat et al (2010)	Economic Impacts of marine Litter
Ofiara et al 1999	Assessment of Economic Losses to Recreational Activities from 1988 Marine Pollution Events and Assessment of Economic Losses from Long-Term Contamination of Fish within the New York Bight to New Jersey
ten Brink et al (2009)	Guidelines on the Use of Market-based Instruments to Address the Problem of Marine Litter

One widely cited study (see **Ofiara et al 1999, EPA 1990**) estimated economic losses due to major incidents in 1987 and 1988 when debris washed ashore on the Atlantic Coast of the United States after being released from the Fresh Kills landfill in New York. An estimated $1 billion (€1.5 billion in 2011) were lost during those two summers because of decreased tourism along the Jersey shore. Ofiara et al (1999) report reduction in visitation of 26% (range of estimates between 8 and 33%), and local business sales fall by 15 to 40%. Lost expenditures were estimated at $725 million (range $251m-$1227m) (€1120m, €388m-€1896m in 2011), and benefit transfer methods were used to value lost net economic value at $381 million (range $132m-$644m) (€588m, €203m-€995m in 2011).

These incidents involved large quantities of waste with a human health risk and resulted in beach closures, and are therefore representative of 'extreme'

conditions, rather than common levels of marine litter. So while the method is transferable to cases of an event leading to a fall in visits, the specific values are not.

ten Brink et al (2009) cite evidence from Sweden that substantial accumulation of litter on the beach depresses tourism by between one and five per cent. In the worst case scenario, this equates to the annual loss to the local community of approximately £15 million (€19 million in 2011), in addition to 150 person-years of work. The current authors have not been able to find the original study[7]. **At most, this evidence might be viewed as a 'ballpark' estimate of the possible impacts of 'substantial' litter: if it is considered that the Dutch policy would lead from a situation of 'substantial' litter to one of 'not substantial' litter. It appears to relate to reduced visit numbers and the consequences for expenditure (and therefore omits any consideration of the changes in welfare for those who do visit). It is not possible to give further assessment without the original source.**

Many studies note impacts on the fishing industry. For example, **Eidemüller (2011)** reports that the Scottish fishing industry loses 5% of profits annually through marine litter (mainly through repairing damages to propellers and nets). Other work is being carried out in this area, so a full review is not given here. But it is worth noting in passing, because, due to the lack of hard data on the impacts on tourist expenditures, some estimation methods push the boundaries of what is justifiable approximation. **McIlgorm et al (2008)** assumed a flat rate of damage of 0.3%, based on a study by Takehama (1990) that estimated the damage to fishing from marine debris in Japan at 0.3% of the annual gross value of the fishing industry catch. APEC apply that estimate to the value of various sectors in the marine economy, including fishing, shipping and tourism. **However there is no justification for thinking that the effects on tourism will be the same proportion of industry value as the effects on fishing. Certain estimates of the impacts on fishing may be appropriate for transfer to the Dutch *fishing* context, but they are certainly not appropriate for transfer to the Dutch *recreation* context.**

Mouat et al (2010) report a questionnaire developed to investigate the effects of marine litter on tourism. 16 UK tourist authorities responded and agreed that a clean and high quality coastal environment was important or very important for tourism branding. The majority believed that only natural debris such as seaweed was acceptable in the marine and coastal environment; all man-made litter is unnecessary and unacceptable. All the tourist organisations reported that complaints about marine litter and rubbish on the beach were extremely rare. Altogether, these organisations had only received 13 complaints about marine litter in total with tourists more likely to switch to other destinations rather than complain. **This evidence is interesting but**

[7] The citation (OSPAR, 2007) is not in the IEEP report's reference list, and review of the likely sources (OSPAR 2007, OSPAR 2007a) as well as more recent material (OPSAR 2009) does not yield any reference to the original study. Other reports citing this evidence (e.g. Mouat et al 2010) give ten Brink et al (2009) as the source.

essentially anecdotal – it can be assumed that Dutch tourism organisations would also agree that clean environments are important to tourism, but this is not sufficient evidence on which to base a cost-benefit study.

There are also several studies looking at expenditures to clean up litter on beaches (Miljøstyrelsen, 2008a; KIMO, 2008; Enveco and DHI Sweden, 2012; Tillväxt Bohuslän, 2010; MEDDE, 2012a and MEDDE, 2012b). Information on these studies can be found in the database, however they are not reported in detail here. **The estimates of clean-up costs can not be used in cost-benefit analysis in lieu of values for the benefits to recreation from cleaning litter: to do this would involve a circular argument, since the costs of litter control are included as the costs in the CBA.**

Summary for the Dutch situation

While it appears clear that reductions in marine litter could lead to changes in visitor numbers and therefore visitor expenditures, the literature review found no hard evidence that would be suitable for transfer to the Dutch policy context.

4.3 Behavioural intentions

The overall economic value to recreation from changes in litter depends not only on the change in value per trip but also on the change in number of trips. Therefore studies that focus on behaviour (actual or intended) without attempting to derive economic values are nonetheless highly relevant to the context of valuing changes in recreation. The literature review identified a number of such studies (see Table 12) with only limited scope for transfer to the Dutch context.

Table 12: Studies reporting evidence on actual or intended behaviour	
Reference	**Title**
Ballance et al (2000)	How much is a clean beach worth? The impact of litter on beach users in the Cape Peninsula, South Africa.
Budruk and Manning (2003)	Indicators And Standards Of Quality At An Urban-Proximate Park: Litter And Graffiti At Boston Harbor Islands National Recreation Area
Lindell (2010)	Recreation in Natura 2000 protected areas - visitors and conservation conflicts
Mantero et al (2006)	Apreciación del turista. Calidad de playas y servicios en playas en el Municipio de Gral. Pueyrredon. Encuesta a turistas en Mar del Plata
Morgan (1999)	Preferences and priorities of recreational beach users in Wales, UK
Needham et al (2010)	Recreation Carrying Capacity and Management at Pupukea Marine Life Conservation District on Oahu, Hawaii
Otero and Rivas (1995)	Estándares para la sustentabilidad ambiental del sector turismo
Tudor and Williams (2001)	Investigation of litter problems in the Severn Estuary/Bristol Channel area
UNEP (2009)	Sustainable Coastal Tourism. An integrated planning and management approach

Several studies consider respondents' reported reasons for decisions to visit specific sites.

- **Otero and Rivas (1995)** report a survey conducted with 10,000 customers of TUI (a major German/international travel organisation) on the importance of the quality of the environment. The survey determined that the decision to visit a particular place depended on: (1) the beauty of the landscape; (2) a friendly atmosphere; (3) the cleanliness of the area.
- **UNEP (2009)** reports survey evidence from Germany (sample = 7872) on the question "When thinking about your next holiday, which of the following environmental factors is most important for you?" 64.5% cited 'clean beaches and water', and 59.1% 'no rubbish in the resort or in the surrounding area'.

- **Mantero et al (2006)** examined perceptions of beach quality, finding higher satisfaction (scale 1 to 5) with quality of landscape (4.48) and quality of the environment (4.03) than with water quality (3.60) and quality of sandy beaches (3.42) (overall average: 3.88). However, when the respondents (sample = 1100) were asked what were their motivations for choosing a particular beach, only 6.05% stated the 'state of the environment' and 1.25% the 'state of the landscape'. 'Proximity' was the main motivation for choosing a particular beach (38.26%) followed by 'knowing the beach' (25.09%), 'peacefulness' (15.84%), 'tradition/habit' (12.99%), and 'liking a beach' (10.85%).

- **Morgan (1999)** reports user preferences and priorities for 50 beach aspects at 23 beaches in Wales (sample=859). Landscape/scenery was the most important single factor (11.3% of total), followed by bathing safety (8.3%) and water quality (3.12%). Absence of sewage debris and litter were ranked 4th and 5th respectively, ahead of features relating to facilities. Litter preferences were uncorrelated with the type of beach.

These studies provide only general evidence suggesting that visitors do care about cleanliness, but that other factors may be more important. The details are context-dependent: the level of importance accorded to a specific factor will depend (inter alia) on the actual levels of that factor, on the variation across potential sites, and on respondent awareness of these features. So the general finding is likely to apply to Dutch beaches, but there is little scope to transfer specific results.

Tudor and Williams (2001) report surveys conducted with a total of 2727 people at eighteen beaches on the north and south coasts of the Bristol Channel, and the coast of mid and north Wales, over three years (1998, 1999, 2000), during school holidays. The aim of the study was to determine attitudes, perceptions, preferences and opinions of beach users. The 1998 survey was carried out with 883 people at eight beaches along the south Wales (north shore of Bristol Channel) coast. The 1999 survey was conducted with 763 beach users at seven beaches along the same coast,. In 2000, surveys were carried out at six beaches along south shore of the Bristol Channel (421 respondents) and at seven beaches in mid/north Wales (660 respondents).

The results of those surveys show that 'clean sand', and 'clean water' were determining factors for beach selection (approximately 80% of respondents stated that they would not visit a beach with 3 items of gross litter, and 43% would not visit a stretch of beach with 10 items of 'general litter'). The types of pollution perceived as the most offensive (universally unacceptable) were sewage related debris (SRD) together with the presence of oil; over 90% of respondents stated that they would not visit a beach with 1 SRD item present. A link between perception of a polluted beach and willingness to participate in leisure activities in the sea was also established. The majority of respondents (82%) thought that dogs should not be allowed on beaches during the summer months.

It has to be highlighted that the majority of the beaches studied here contained at least one item of SRD, which is in contradiction with the answers given by respondents. However, it is unclear whether the beach users which were interviewed at the time were aware of the presence of SRD on the particular beach they were visiting.

This contradiction might also be explained by the type of questions used for surveys: whether the respondents would visit a beach on which SRD were present is hypothetical. And of course an individual visitor is unlikely to come into contact with or detect *all* the SRD and other litter items on a large beach. In addition, the decision to make a visit is taken before knowing the exact conditions on the beach – a point that also applies to revealed preference studies. In general, people may not be fully aware of the specific current conditions when they are deciding to travel to a beach, or responding to a survey question about actual or hypothetical beach conditions.

Overall, the response is perhaps best interpreted firstly as a statement that SRD is viewed in a strongly negative light, detracting from the visitor experience if detected; and secondly as an indication that some respondents would avoid beaches where they *expect* SRD to be present, and therefore that some would stop future visits to beaches where they had previously detected SRD.

However, the use of these results to evaluate changes is limited. Again, the results clearly support the fact that people do care about the issue of litter on beaches, but give little guide regarding likely real behaviour impacts in the Netherlands.

In one of the most widely cited studies in this field, **Ballance et al (2000)** present a survey of beach users at Cape Peninsula, South Africa (sample = 1000). Cleanliness was stated as the most important factor in influencing choice of beach, especially by foreign tourists. The study shows that the level of visually detectable wastes on a beach is the most important factor flagged by beach users as the determinant of their choice, especially for tourists. It was estimated that 40% of foreign tourists and 60% of domestic tourists would not return to a beach with more than 10 items of solid waste (plastic bags, food containers and so on) per meter. The study demonstrates that visitors do consider waste in selecting beaches to visit, and that some at least believe that above a certain level they would not wish to visit. **This very general finding is also likely to be true for Dutch beaches (in line with the general body of evidence presented in this report), however the specific proportions stating unwillingness to visit over a particular level could not be transferred reliably, partly because the question is hypothetical, and also because the type of beach use is likely to be different (for climatic and other reasons) and the threshold in any given area is likely to depend on the cleanliness of other alternative beaches.**

Lindell (2010) examined visitor and conservation conflicts in a Swedish Natura 2000 protected area, Stendörren in the Södermanland archipelago. Visitor conflicts were analysed by carrying out interviews and a questionnaire survey. One hypothesis of the paper is that the large number of visitors might be a threat to the areas' Natura 2000-

natural values, i.e. there is a potential conflict between management goals for conservation on the one hand and recreation on the other.

Although the paper does not specifically focus on marine litter it does present some interesting aspects on visitors' attitudes towards litter. For example it was found that one of the greatest conflicts in the Stendörren area was linked to both land and sea-based litter. 34 % of the respondents stated that litter disturbs them when visiting the area. The three recreation activities which are most negatively affected by litter are kayaking/canoeing, picnicking/grilling, and bird-watching.

Most interestingly, respondents were asked whether they would visit the area more (or less) often if there was less littering. The stated intentions were that 81 % would visit the area as often as before, 11 % would go there a little more often and 4 % would go there a lot more often. Other factors presented for the respondents included 'fewer visitors', 'more nature trails', 'fewer boats' and 'noise free zones'. The survey suggested that 'less littering' could be the second most important factor, after 'fewer visitors', in promoting additional visits. This suggests that, here, overcrowding is more of a problem than litter – and this might suggest, paradoxically, that any litter-related boost to visits could be counter-productive, through worsening a congestion problem that is seen as more important.

The specific proportions of visitors with different behavioural intentions in this study can not be transferred directly to all Dutch beaches: the study site is a high nature-value area used for nature-based recreation, and has a low local population (though about 1 hour from Stockholm). The current litter problem is relatively small, with only 34% identifying it as a problem. The most interesting finding is that 'fewer visitors' was ranked higher than 'less littering'. This may be because current litter is relatively low, and also because the type of nature-based recreation on offer requires relative peace and quiet. However, for the Dutch context the possible dis-benefit of increasing congestion should at least be considered when evaluating any possible increase in visitor numbers arising through litter reductions on specific beaches.

Needham et al (2010) examine attitudes among tourists and residents of coastal sites in Hawaii, USA (sample = 1399). Eight hypothetical scenarios were presented, describing changes in four factors: use level/density, presence of litter, damage to reefs, and condition of facilities. Respondents rated their acceptance of improving awareness/education, restricting use, increasing facilities, and improving maintenance for each scenario. The amount of litter was consistently among the least important factors influencing support of each management action: damage to reefs was the most important factor influencing acceptance of improving awareness; use level was most important when rating acceptance of restricting people; and facility conditions were most important in acceptance of increasing maintenance and facilities.

However the litter characteristic was given as "None (e.g., no pieces of litter seen)" or "Some (e.g., one or more pieces of litter seen)" and this might be seen as less of a distinction than the other categories for use level (Low, less than 35% of people feel

crowded vs. High, more than 65% of people feel crowded), reef damage (Minimal, less than 25% of corals broken or trampled vs. Substantial, more than 75% of corals broken or trampled), and facilities (Good, more than 75% of facilities clean and in working order vs. Poor, less than 25% of facilities clean and in working order). The authors suggest possible extensions to study design that might give more scope to consider variations in condition, suggesting "for example, including three or more factor levels for litter such as "none," "one to five pieces," and "more than five pieces"."

Thus, in the opinion of the present authors, the findings of the Needham et al study do not provide strong support for the idea that litter would be less important than other factors. However, they can be taken as supporting the need at least to consider overcrowding issues when assessing any new trips generated by litter reductions. The study context (tropical beaches with reef tourism) is very different from the Dutch case and specific results can not be transferred.

Budruk and Manning (2003) examine visitor evaluations of a range of litter and graffiti at Georges Island, Boston Harbor Islands National Recreation Area, USA. They report an initial survey (sample = 695) identifying litter and graffiti as important indicators of quality. A more detailed study (sample = 223) then looks at satisfaction/enjoyment ('acceptability' of different conditions), behavioural intentions (thresholds for tolerance/displacement of activity) and thresholds for management actions (beach closures).

They use the 'Keep America Beautiful' (KAB) Litter Index approach to litter evaluation. Standardized series of four pairs of photographs depict increasing amounts of litter, on four point scoring system. Pairs of photographs are separated to represent two versions, each with four photographs (one from each pair). In addition, they use a Photometric Index (P.I.) approach using standardized (16ft x 6ft) horizontal grid of 96 cells overlaid on a park scene. Litter accumulation is measured according to the number of cells occupied by litter. The four photographs used in the study represented litter P.I. ratings of 0 (no litter), 4 (4.2% of cells have litter), 8 (8.3%) and 12 (12.5%).

Respondents were asked to rate photographs on scale of –4 ("very unacceptable") to +4 ("very acceptable"), and to indicate the photograph that depicts the 1) amount of litter preferred; 2) highest amount of litter that is acceptable; 3) amount of litter that is so unacceptable that respondents would no longer visit; 4) highest amount of litter that the National Park Service should allow before visitor use is restricted; and 5) amount of litter typically seen.

Results are shown in Table 13. The 'photo #' columns represent the average photograph selected in each case – from #1 with no litter, to #4 with most litter. S.D. is the standard deviation of the responses. The 'preferred state', unsurprisingly, is close to zero litter. The acceptable state is a bit higher, and generally quite close to the actual amount of litter experienced. The point at which respondents felt management action to restrict access would be warranted is a little higher still. And the point at which respondents would stop visiting is substantially higher – in fact, it is

likely that the study has a truncation bias, in that many respondents would carry on visiting at higher levels than those presented on the most littered photographs used in the study.

Table 13: Visitor norms for litter: results from Budruk and Manning (2003)

KAB Litter index	**Version I (N=110)**		**Version II (N=113)**	
	Photo #	**S.D.**	**Photo #**	**S.D.**
Preferred state	1.10	0.4	1.07	0.4
Acceptable state	1.56	0.6	1.47	0.6
Typically Seen	*1.54*	*0.6*	*1.83*	*0.6*
Visitor use should be restricted	2.13	0.9	2.26	0.6
Stop visiting	3.57	0.6	3.70	1.0
Photometric index (N=223)	**Photo #**	**S.D.**	**P.I. Rating**	**S.D.**
Preferred state	1.04	0.2	0.2	0.8
Acceptable state	1.55	0.6	2.2	2.4
Typically Seen	*1.59*	*0.6*	*2.4*	*2.2*
Visitor use should be restricted	1.97	0.9	3.9	3.5
Stop visiting	3.32	0.7	9.3	2.6

This is an interesting approach that could be applied in the Netherlands. The photometric index is a standardised method, and for transfer purposes, there could be potential to assume similar thresholds for displacement at Dutch beaches and use this to estimate a distribution of proportions of visitors lost as litter increases. However this would be at best a very approximate approach, and using it in practice would require a series of measurements of the photometric index of litter concentrations on Dutch beaches. The stated behavioural intentions are hypothetical, and could diverge from actual behaviour under changed conditions. In particular, visit rates to a particular beach may depend more on *relative* cleanliness (compared to alternative sites) than on the *absolute* measures of cleanliness presented via photographs.

Summary for the Dutch situation

Unlike the case of stated preference surveys, in most of the studies covered here the respondents are not being asked to evaluate or compare clearly defined situations: rather, they face questions about the reasons for their choices, and it is difficult to transfer the answers because information is lacking on the actual conditions the respondents faced at the interview sites and at alternatives.

The exceptions are Needham et al (2010) and Budruk and Manning (2003). The former involves comparison of hypothetical scenarios, but the characteristics used have only two levels each, and the litter variable shows low variation; also the study context is too different from the Netherlands for transfer to be recommended. The Budruk and Manning study focuses on litter (and graffiti) and uses a photographic index for litter that is standardised and therefore in principle transferable to the Netherlands. The specific results may not be transferable, however: this would depend on the preferences of their respondents corresponding to the preferences of Dutch beach users. Also, the stated behavioural intentions are hypothetical, could diverge from actual behaviour under changed conditions, and may depend on relative cleanliness (compared to alternative sites) as well as the absolute measures of cleanliness presented via photographs.

Actual transfer to the Dutch context would require additional work to assess current levels of litter on Dutch beaches and likely future levels under the policy changes, and to express these in terms of the standardised photographic index. It seems likely that the first part of this work would be required anyway for the policy analysis, and the use of the photographic index might be a useful way to present the policy impacts in a visual and understandable format. If so, then it might be useful to draw on the Budruk and Manning results, to indicate where 'current' and 'future' Dutch beaches lie on their 'preferred' – 'accepted' – 'stop visiting' scale. Beyond that, it would be difficult to use these results to inform <u>values</u> for a cost benefit analysis.

4.4 Attitudes and preferences

Most of the original studies found in the literature search do not give evidence on economic values or behaviour, but focus rather on stated attitudes and preferences (though of course the boundary with analysis of behaviour can be a little fuzzy).

Table 14: Studies reporting evidence on attitudes and preferences for litter	
Reference	**Title**
AFD (2008)	Le coût économique des déficiences de l'assainissement en Polynésie Française
Bontet (2011)	Usages Recréatifs et Organisation Spatiale de la Plage au Japon
Cervantes Rosas and Espejel (2009)	Evaluación de la playa municipal de Rosarito, Baja California, México,mediante la percepción de los usuarios. Manejo, Gestión y Certificación de Playas. México
Dawson et al (2000)	Visitor Satisfactions: Backcountry And Wilderness Users In The White Mountain National Forest
De Ruyck et al (1995)	Factor Influencing Human Beach Choice on Three South African Beaches: A Multivariate Analysis
Gutiérrez Cuevas (2008)	Evaluación de la capacidad de carga recreativa e implicancias de las actividades ecoturísticas en la zona de uso intensivo de la reserva nacional radal siete tazas, vii región, chile
Hall (2000)	Impacts of Marine Debris and Oil: Economic and Social Costs to Coastal Communities
Hold Danmark Rent (2012)	Analyse - Henkastet affald på de danske strande
LH2 (2011)	Les Français et leur perception de l'état de santé de la mer en métropole
Madanes et al (2010)	Comparación de valoraciones de playas argentinas según la edad de los usuarios

Ponce Sanchez (2004)	La calidad ambiental como factor competitivo de los destinos tradicionales de sol y playa
Preißler (2008)	Wasserqualität an europäischen Küsten und ihre Bewertung durch Touristen
River Consulting (2008)	The direct impact of recreation on water quality in the Great Barrier Reef Marine Park
Rollins and Connolly (2002)	Visitor Perceptions Of Clayoquot Sound: Implications From A Recreation Specialization Model
Schroeder, H. S and L. M. Anderson (1984)	Perception of Personal Safety in Urban Recreation Sites
SEPA (2008)	Tourism and recreation industries in the Baltic Sea area
Tonge and Moore (2007)	Importance-satisfaction analysis for marine park hinterlands: A Western Australian case study
UNESCO (2007)	Introduction à Sandwatch (Surveillance des plages): Outil pédagogique pour un développement durable

Several studies provide only extremely general evidence on a link between litter and recreation.

- **Madanes et al (2010)** conducted a survey in 2 municipalities of the Atlantic coast of Argentina (Necochea and Puerto Madryn) on the perception of beach users (sample=329) of the biophysic, social and infrastructural conditions of the beaches. For all the beaches, cleanliness was given as a main reason for the satisfaction of beach users.

- **Ponce Sanchez (2004)** presents survey evidence on the perception and degree of satisfaction of users/visitors to Mar Menor, Murcia, Spain. About 30% of respondents stated that the aspects for which urgent solutions were needed were environmental aspects: hygiene, cleanliness and conservation of the beach/sea.

- **Cervantes Rosas and Espejel (2009)** surveyed users of the beach at Rosarito, a long, wide and sandy located on the Baja California, Mexico, regarding their perception of the condition of the beach. Asked "What do you dislike on this beach?", 18% of respondents disliked the fact that the beach was not clean (34% answered 'nothing' and 30% answered 'horses').

- **AFD (2008)** report "satisfaction" surveys conducted with international visitors on the day they leave French Polynesia. In 2008, 7% of respondents were dissatisfied with "dirt/fouling, pollution and noise" (2004: 4.8%; 2002: 11.8%).

- **Bontet (2011)** reports a survey (sample=75, mostly university students) conducted in May/June 2011, on respondents' use, experience and representation of Japanese beaches. When asked "What features do you like to find on a beach?", the respondents to the survey stated "Beautiful landscape" (69%), clear waters (55%) and "cleanliness" (48%).

- **De Ruyck et al (1995)** present the results of a survey conducted with visitors to three beaches in and around Port Elizabeth, South Africa. Litter was perceived as a problem on all three beaches (73% at Joorst Park, 40% on King's Beach and 37% at Sardinia Bay); the majority of respondents felt that litterbugs should be fined (78% at Joorst Park, 94% on King's Beach and 98% at Sardinia Bay). Most visitors to the least developed beaches (Sardinia Bay) wanted dogs to be allowed on beaches whereas visitors to developed beaches (King's Beach and Joorst Park) did not want dogs on beaches partly due to the unhygienic conditions that dogs can create (23% at Joorst Park, 47% on King's Beach and 50% at Sardinia Bay).

- **Preißler (2008)** examines the perception of litter on European marine bathing beaches/waters by actual and potential tourist/visitors on the island of Sylt in northern Germany (actual tourists/visitors), and in a travel agency in Hamburg (potential tourists/visitors). 94.2% of actual visitors/tourists to Sylt, and 93.7% of potential future visitors/tourists feel disturbed "very strongly" or "strongly" regarding litter on beaches/in the water. Corresponding figures for other marine regions are: overall North Sea region (88.9%), Mediterranean (91.1%), Baltic Sea (97.5%), Atlantic Ocean (100%).

These studies provide general evidence that tourists do not want to find/see litter on beaches, and so support the inclusion of some value for cleaning up litter, but do not help to determine what that value might be.

Hold Danmark Rent[8] (2012) present survey evidence providing an overview of the attitudes to beach litter among Danish and German visitors in Denmark. The report discusses how the experiences of Danish and German tourists of visiting a beach are affected by litter. Similar surveys were also carried out by Hold Danmark Rent in 2011 and 2010. Clean Danish beaches are considered crucial by nine out of ten German tourists (sample: 516) when choosing to visit Denmark. 36% of the Danish respondents (sample: 1032) think that the amount of beach litter is too high - but at the same time a third of the Danish respondents admit to throwing litter on the beach. **UNESCO (2007)** also report survey respondents stating that they enjoy clean beaches but admitting that they had discarded litter on the beach.

One interesting result of the survey is that people report being willing to pay more for a leisure home situated near a clean beach. 40 % of the Danish respondents, and 30% of German respondents, would be willing to pay more for their summer house if

[8] "Keep Denmark Tiny"

situated near a clean beach. The size of this WTP is not estimated, but the result can be taken as evidence for some positive benefit from clean beaches.

This conclusion can be transferred to the Dutch context, and would suggest that cleaner beaches could result in higher property values in coastal areas, but gives no guidance on how much higher the values might be.

LH2 (2011) report a telephone survey conducted in France with 1315 people in May 2011, in relation with the perception of the state of the sea by the French. This survey was commissioned by the French Agency for Marine Protected Areas under the MEEDEM (Ministry of Economy, Energy, Sustainable Development and the Sea). 97% of individuals surveyed think that the issue of marine litter (plastic bags, bottles,…) is "preoccupying" and 19% think this is an issue which should be addressed. 86% of respondents think that the actions currently undertaken to tackle the issue of marine litter are not sufficient. 97% of respondents are "bothered" when they find litter (cans, plastic,…) on a beach; 95% are "bothered" when they find traces of oil on a beach; 73% by dead animals and 40% by algae left by the sea. 85% of respondents have been confronted by the issue of litter on a beach. 20% of respondents claim to have cancelled a trip or a recreational activity because of the presence of litter on a coast.

Again, these results are quite likely to be reasonably representative of what Dutch respondents might say, at least in terms of the strong negative view of marine litter. The claim that 20% have cancelled recreational activity due to litter is hard to assess/transfer: it does lend support to the idea that presence of litter could under some circumstances result in significant loss of recreational value, but gives no information on the specific circumstances under which the cancellations took place, so it is not possible to infer whether or not they might apply to Dutch beaches, or whether the policy changes would result in improvement.

Rollins and Connolly (2002) report that visitors to Clayoqout Sound, Canada (sample = 760) are concerned about a number of aspects of the marine environment, including the amount of visible logging, presence of fish farms, airplane noise and boat noise. . Of lesser significance are issues that relate more directly to visitor behaviour, including litter, crowding, and vandalism. Visitors perceived 'litter on beach'(22%) to be a concern. Concerns for beach litter increase from 16% for the people with low place specialization to 62% for people with high place specialization, i.e. a particular focus of their recreational activity in the specific area.

This is interesting in suggesting that local/regular users may be more concerned about litter than occasional users. This makes sense, because location-specific users would face substantial costs in relocating their recreation, whereas the others can switch more easily to other areas with less litter problem. This result is likely to be general and could apply in the Netherlands. In particular, if a policy option of cleaning specific beaches (while leaving others) is considered, then it should be recognised that this might provide a general benefit to day-trippers (giving them a selection of clean beaches from which to choose) and a high benefit to locals (regular users of the cleaned beaches), but provide no benefit to regular

local users of other beaches[9] (for whom the costs of relocating to the clean beaches might be too high – e.g. involving transport use rather than walking to the beach).

Evidence is also available from terrestrial sites, for example:

- **Gutiérrez Cuevas (2008)** reports a survey of visitors to Radal Siete Tazas National Reserve in Chile (a terrestrial site, with water features). They were asked "In the following situations that might come up during your stay, how do you rate them?", with reference to pictures representing eight criteria for campsites and paths and the level and degree of visitor impacts on them. The respondents thought that the carrying capacity of the area had not been exceeded, though some areas had too many visitors. 'Seeing trash during their stay' was perceived as very unpleasant by 60-77% of respondents, depending on the site.

- **Dawson et al (2000)** survey hikers/backpackers (sample = 395) in backcountry and wilderness areas in the White Mountain National Forest, New Hampshire, USA. Absence of litter and waste was considered by respondents as very important, and the one condition rated as 'very satisfying' was 'no litter and waste'.

- **Schroeder and Anderson (1984)** report a small survey (sample = 68) rating photographs from 17 urban recreation sites in Chicago and Atlanta. Features reflecting maintenance problems and abuse (graffiti, litter) tend to lower judgments of both security and aesthetics.

In these studies, the respondents' perceptions and reported satisfaction are clearly influenced by the general state of the environment at the time of the visit. They provide evidencde for litter being a potentially important feature of recreation sites but do not otherwise help with assessing a value for the Dutch policy proposals.

Tonge and Moore (2007) present an 'importance-satisfaction' analysis for Swan Estuary Marine Park in Western Australia (sample = 132). The technique involves contrasting evaluations of the extent of an issue ('satisfaction') with the importance accorded to the issue ('importance'), to separate issues that require policy attention (satisfaction is less than importance) from issues that do not (satisfaction is greater than importance). They find that the quality of visitor experience is adversely affected by the condition of the River and path, the presence of litter and the lack of wildlife. For 'presence of litter', they report satisfaction 4.2, and importance 4.5 (on a scale of 1 to 5) and report that this gap of -0.3 is significantly different from zero[10].

[9] Except reduced visitor numbers, which could be a benefit.

[10] p-value 0.005, i.e. less than 0.5% chance that the result is a chance finding.

Results in importance-satisfaction studies are dependent on initial conditions, so for any potential transfer to the Netherlands these would need to be assessed and compared. There are also more fundamental methodological issues, including that there is no particular reason why respondents should evaluate importance and satisfaction on similar scales, and so no clear rationale for concluding that importance exceeding satisfaction is a necessary or sufficient reason for implementing policy.

Hall (2000) reports evidence from a study by Kent County Council (Gilbert, 1995) that suggested that expectations regarding cleanliness vary with the public's perception of the locality. Twelve percent of visitors to the port of Boulogne thought the beach to be unacceptably dirty, but at Wimereux, an upmarket resort to the north, the figure rose to 28% - even though the beaches there were in fact substantially cleaner.

This finding may also hold for Dutch beaches – for example, higher standards of cleanliness may be demanded for nature conservation areas than for heavily used sunbathing / fogbraving beaches - however there is no evidence that could be used to transfer this finding, and within the overall uncertainty of the cost-benefit exercise such nuances are perhaps best left to one side.

River Consulting (2008) report a small survey (85 responses) of independent recreational visitors (shore and vessel based) to the Great Barrier Reef Marine Park. Respondents in both surveys—29% of shore-based respondents and 36% of vessel-based respondents—nominated rubbish as the major key water quality issue. Some respondents commented that tourists tended to litter while locals would commonly pick up rubbish. The authors thought that the visual presence of rubbish, in contrast to the invisible character of some other pollutants, influenced respondent perceptions. **SEPA (2008)** also argue that litter may be overemphasised because people do not understand more complex environmental impacts. They present the results of an interview study (sample = 87) conducted with key persons in the tourism industry in all the Baltic Sea countries, focusing on their views on the importance of various marine environmental factors for their businesses. Litter is seen as an important problem, and litter control the most important action. But the authors note that respondents generally seem not to understand the phenomenon of eutrophication – its causes, character, mechanism, effects and impacts – and that the same holds for all the ecological processes taking place in the Baltic Sea. Some of the most visible symptoms are noticed, for example algae or oil stains on the beaches, but the true causes and impacts of these phenomena are not understood, and in some cases are considered natural, and the extent of the impacts is underestimated. Therefore the finding that respondents consider litter on the beaches to be the most serious environmental problem of the Baltic Sea may be grounded in ignorance of the other problems.

These results may also hold for the Dutch coast – people may focus too much on litter, and less on 'invisible' problems. However the policy context of the MSFD (and associated policies) is one in which all marine environmental problems are being addressed. So comparison of the relative importance of litter and other

issues is not really an issue here. What matters, certainly from an economic perspective, is how people behave and feel – with reduced litter, do they make more trips, do they value their recreation time more?

Summary for the Dutch situation

The results presented on attitudes and preferences provide support for the general observation that visitors/tourists generally have quite strong preferences for litter-free recreation sites. There is little scope, however, for using any specific figures in the Dutch cost-benefit calculations.

Some evidence on details/nuances may be relevant to the Dutch context. One is the suggestion that highly location-specific users (those who habitually use a specific area) may be much more concerned about litter than non-location-specific users (those who use a wider range of areas). This may be a relevant consideration for some Dutch policy options, but taking it into account would require analysis of specific beaches and their use at quite a detailed level. Similarly, it is likely that user demand for cleanliness may vary according to expectations and the type of beach and recreation activities, but it seems unlikely that this could be taken into account in detail.

Finally, people generally may be more concerned about litter than about other marine environmental issues in part because it is more visible and because they don't understand the other issues fully. However, from the perspective of valuing recreation impacts, this is not particularly relevant: what people think they know will largely determine their choices and the benefits they experience from recreation, and the other issues are being addressed under different policies.

5. Using evidence for Dutch cost-benefit analysis

5.1 Scope for meta-analysis

Since the beginning of the 1990s, meta-analysis has been playing an increasingly important role in environmental economics research, especially economic valuation of environmental change (e.g. Stanley, 2001; Nelson and Kennedy, 2009; Johnston et al., 2009). Meta-analysis is the evaluation of the findings of empirical studies, such as stated or revealed preference studies, helping to extract information from usually large data sets in order to quantify a more comprehensive assessment. It is a method of synthesizing the results of multiple studies that examine the same phenomenon through the identification of common effects. Meta-analysis enables researchers to explain differences in outcomes found in single studies, in this case for example beach recreation behaviour, on the basis of differences in underlying assumptions, standards of design and/or measurement. For example, travel behaviour to beaches based on the physical characteristics of the beach, including the presence of litter if such data are available, the characteristics of the visitors, the type of recreational activities undertaken on the beach, and the methodological characteristics of the study carried out to analyze travel behaviour.

Meta-analysis depends, therefore, on having a good dataset of high quality and fully described valuation studies. For marine litter, although the total number of studies found is reasonably large, relatively few of them give the kind of detailed information that would be needed for transfer to the specific case of Dutch policy to reduce marine litter.

Several of the sources consulted noted the general lack of good-quality data in this area. Prayaga et al (nd) report that "despite the wide range of benefits provided by the beaches there is very limited literature on the value of beaches." They cite only three other studies for Australia (none of which touch on the litter issue). Östberg et al (2010) state that "to our knowledge, there are previously no stated preferences valuation studies on noise from boat traffic and/or littering in coastal areas in northern Europe."

Potts and Hastings (2011) present a detailed study on marine litter in Scotland (carried out under essentially the same context as the Dutch policy[11]): their cost-benefit analysis records 'no data' for the economic impact of litter on recreational angling, on marine and coastal wildlife tourism, on recreational sailing and on tourism (Scottish total), as well as on visual amenity. Only the impact of litter on 'marinas' is recorded as 'emerging data'. They note that "more research is required to determine the

[11] The aim was to "contribute to developing a marine litter strategy for Scotland's seas in light of the Marine (Scotland) Act 2010, and the implementation of the EU Marine Strategy Framework Directive (MSFD)."

overall affects marine litter has on recreational use" and stress in particular that "there is a pressing need to advance research on the perceptions and interactions between tourists and coastal litter and at what level litter will shift tourism away from a particular site." Such statements from recent work lend support to our overall finding that there is to date rather sparse evidence in this area.

Insofar as meta-analysis is concerned, a major problem is the lack of data and information about beach litter in order to allow an assessment of its impact on visitation rates and perception of beach quality. Many travel cost studies and stated preference studies like contingent valuation have been carried out to analyze beach visitation behaviour and public valuation of beach and shoreline quality, but very few of these studies explicitly account for the role of beach litter on beach recreation activities; even where litter is included, it is often combined with other factors in a more general 'environmental quality' variable.

One option would be to collect additional data and information about beach litter for all of these studies, but this would require not only going back to each beach in the various studies, but also requires having access to detailed litter information for each beach at the particular point in time in which the study was conducted. Given current incidental monitoring of beach litter, this is not considered a feasible option.

Perhaps one of the reasons for limited valuation research in this area is that litter levels are associated with recreation since visitors are often a major source of litter. This may make it difficult to use litter as a variable in travel cost models: litter levels are higher where there are more visitors, creating a statistical problem for attempts to separate out the impact of litter on visit rates. This issue could be subjected to future research. Further work, using stated and revealed preference, and including before/after studies, could be valuable in enhancing the evidence base. The introduction of policy to meet the MSFD targets represents an opportunity to carry out such research.

Recommendation: it is not possible at present to carry out meta-analysis of the impact of litter on coastal recreation values. The introduction of MSFD policies across Europe offers an opportunity to explore the impact of litter reduction on recreation values, and in particular to carry out before-after studies of the impact on litter and visit rates.

5.2 Consideration of new trips to Dutch beaches

In the context of the Dutch policy, there are two possible effects to consider: firstly, the change in litter levels will result in a change in the unit value of recreation, with all visitors enjoying some benefit from cleaner beaches. Secondly, cleaner beaches may encourage more visits to beaches, both through increased visit rates for existing visitors, and through encouraging new visitors who were previously put off by levels of litter.

Most valuation effort in recreation has focused on the value of a unit of recreation – most often the value per visitor, per trip, and in some cases value per visitor, per year or in perpetuity. Bateman et al. (2002) liken this to the preparation of 'horse and rabbit stew': the fine and detailed preparation of the rabbit (unit values for recreation, calculated by ever-more detailed econometric techniques) is overwhelmed by the addition of the horse (the number of visitors, little studied and little understood).

This is somewhat less of a concern for policies that will change conditions across the board – if the Dutch marine litter policy results in improvements for all beaches, then there is less concern about changes in visit numbers due to visitors changing from one beach to another; only entirely new visits come into play. On the other hand, for policies in which clean-up is focused on particular beaches, switching from dirtier to cleaner beaches may be important.

There are also further possible effects to consider if increased visits occur. Firstly, the people making these visits have switched from some other activity – perhaps visits to the countryside, perhaps shopping, perhaps just sitting at home, but some other activity, with non-zero value. Secondly, where the beaches visited can be considered congested, the encouragement of additional visits will result in some loss of benefit to existing visitors. 'Congested' in this context does not necessarily mean 'crowded', but rather that the density of use detracts from the value to each individual, and this can occur at quite low use levels - on remote beaches, for example, one of the key attractions may be the ability to walk along the beach without seeing or hearing many other humans.

Finally, from a data availability perspective, it will be relatively straightforward to estimate the total number of visits to Dutch beaches in an average year. It will be much harder – perhaps impossible, given the lack of evidence found in this review - to estimate with any accuracy the likely changes in visit numbers due to changes in litter. But it seems reasonable to expect that any realistic change in visit numbers, across the whole country, will be quite small in comparison to the total number of existing visits.

To summarise:

- There is a lack of hard evidence on changes in visit numbers as a result of reductions in litter.
- Most studies involve hypothetical questions about behavioural intentions for different levels of litter, and these are subject to error.
- In most cases the study conditions differ from Dutch conditions, and in any event the study results are likely to depend as much or more on relative conditions as on absolute conditions.

- Furthermore, there are indications that congestion on beaches may be seen as more important than litter, suggesting that any 'trip generation' benefit of litter reduction might be partly or wholly offset by an 'overcrowding' cost.

- It seems reasonable to expect that changes in visitor numbers (taking all Dutch beaches together) will be quite small compared to total visits (further research could examine this, through 'before' and 'after' studies of policy changes).

Recommendation: Therefore, it seems appropriate to leave to one side the question of changes in visit numbers, and focus on the change in value per visit, for which better data are available. This is also a conservative approach.

5.3 Consideration of changes in value per trip

The above recommendation places the focus squarely on the change in value per trip arising through cleaner conditions. Unfortunately, as discussed in section 5.1, there is not enough evidence for meta-analysis or development of a benefit function for transfer. The only real scope for transfer is through point-transfer from individual studies. And the only studies that fit the task are the surveys carried out by Tinch and Hanley. As discussed in section 4.1, these have the following key advantages:

- they are recent (2012);

- they consider debris explicitly (having been designed with an eye to informing implementation of the MSFD);

- they have involved similar surveys in three areas (Republic of Ireland, Northern Ireland, Scotland) that have sufficient similarity in terms of environment, population and economies to make transfer to the Netherlands justifiable;

- although using a stated preference method (meaning that the choices are hypothetical), the choices do involve clear comparison of different scenarios (and not direct elicitation of willingness to pay as in contingent valuation).

To be conservative, the value for litter collection only (calculated as the value for 'collection and prevention' minus the value for 'prevention') should be used. The value for the Republic of Ireland is €0.60 per trip, while that for Northern Ireland is €1.64. One option would be to attempt to determine similarity between areas, using the Northern Irish values for more densely populated areas and more heavily used beaches in the Netherlands. Alternatively, the figures could be used as a high-low range across the whole country.

On balance, it is probably more appropriate to consider the figures as a high-low range, reflecting the uncertainty in valuation and transfer, than to attempt to match specific source studies to specific areas in the Netherlands, which would add an additional level of uncertainty while giving the *appearance* of a more precise transfer method.

The Scottish figures, which are higher at €3.97 per trip, apply to surfers and kite-surfers, and might be used for in-water recreation trips in the Netherlands – people who are likely to spend longer periods at the beach, in the water, and who are at more risk of injury through contact with debris in the water. This might be considered if detailed data are available on different types of recreation users and if it is thought necessary to account for the higher values likely to apply to intensive in-water users. However, the number of such users will be rather small in comparison to total trip numbers. Again, it would be conservative to consider only the lower figures, and would avoid giving the impression of precision by distinguishing between user groups.

Recommendation: use a range of €0.60 to €1.60 per trip for the value of moving from partly littered to fully clean beaches. This should be considered alongside estimation of likely impacts of policy: if beach cleanliness will not be as complete as the cleanliness that would be expected under a policy of litter collection on beaches, the values should be scaled back accordingly. The spread of values can be considered as reflecting the uncertainty in valuation and transfer, and it should be stressed that this is an approximate method used in the absence of full data.

The possibility of higher values for some users, and the likelihood of non-use values for litter-free marine environments held by the general population, can both be recognised as possible additional values, without attempting to place monetary figures on these. This is conservative, avoids criticism targeted at the uncertainty of non-use values, and avoids the impression of claiming more precision for the transfer than can be justified.

6. Conclusion

The largest group of studies reviewed comprised those reporting quite general information on attitudes. Mostly these confirm the common-sense presumption that visitors prefer clean beaches, but there is little scope for using the numerical results for valuation purposes in the Dutch case. A few studies provide more interesting ideas: that location-specific users may be more concerned about litter than non-location-specific users; that demand for cleanliness may depend on expectations and other local factors; that litter may be emphasised by visitors partly because they do not see or understand other marine environmental problems. These ideas probably apply to visitors to Dutch beaches too, but their incorporation in the policy evaluation is either impractical or unnecessary.

Evidence found on behavioural change in response to changes in litter was patchy and largely hypothetical. Transfer of this evidence to the Netherlands would not be appropriate. However the use of a standardised photographic index for litter could be a useful way to communicate the impacts of policy options, and if that were done then it could be appropriate to compare the status quo and policy proposals with the results from Budruk and Manning (2003), indicating where 'current' and 'future' Dutch beaches lie on their 'preferred' – 'accepted' – 'stop visiting' scale.

Evidence on the local economic impact due to changes in litter (and associated changes in visitor numbers) was scant, with the exception of studies of a major landfill release incident in the US. While it appears clear that reductions in marine litter could lead to changes in visitor numbers and therefore visitor expenditures, there is no hard evidence that would be suitable for transfer to the Dutch policy context.

That leaves the economic valuation studies. Of the few that were found, most did not fully separate litter from other more general environmental quality issues, and this seriously reduces their suitability for transfer to evaluation of a policy specifically focused on litter reductions. It also means that there is no real scope for meta-analysis on the specific issue of litter.

The most recent studies, by Tinch and Hanley, do separate litter ('debris') from other factors, and also separate policies of litter 'prevention' from litter 'prevention and collection'. These studies yield a range of values from different areas (Scotland, Northern Ireland, Republic of Ireland) with slightly different characteristics that are close enough to the range of situations in the Netherlands (climatically, environmentally, economically and socially) to allow transfer to be a reasonable proposition. These values give the most suitable evidence available for transfer to the Dutch policy evaluation.

The recommendation is to use a range of €0.60 to €1.60 per trip for the value of moving from partly littered to fully clean beaches. This should be considered alongside estimation of likely impacts of policy: if beach cleanliness will not be as

complete as the cleanliness that would be expected under a policy of litter collection on beaches, the values should be scaled back accordingly. The spread of values can be considered as reflecting the uncertainty in valuation and transfer, and it should be stressed that this is an approximate method used in the absence of full data. It is transfer based on a small number of studies using the same methodology, and so is less robust than transfer based on meta-analysis results of a large number of studies, or primary data.

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