



Marine litter: Progress in developing an integrated policy approach in Scotland



Emily Hastings^{a,*}, Tavis Potts^b

^a The James Hutton Institute, Craigiebuckler, Aberdeen AB15 8QH, UK

^b Scottish Association for Marine Science, Oban, UK

ARTICLE INFO

Article history:

Received 20 December 2012

Received in revised form

23 January 2013

Accepted 29 January 2013

Available online 1 March 2013

Keywords:

Marine litter
Marine policy
Policy integration
Scotland

ABSTRACT

Marine litter is a problem that undermines the Scottish Government's vision for 'clean, healthy, safe, productive, biologically diverse marine and coastal environments, managed to meet the long term needs of nature and people'. The impacts of marine litter extend to environmental, social and economic spheres but currently the understanding of effects is limited. It is clear however, that marine litter can impact on a range of resources and ultimately threaten policy goals such as the Marine Strategy Framework Directive (MSFD) and its focus on delivering a clean and healthy marine environment. The Scottish Government has initiated a process to advance a marine litter strategy as part of its response to the MSFD. This paper draws upon the literature and practice of environmental policy integration to identify opportunities and obstacles in the emerging policy response in Scotland. Ultimately, any marine litter strategy for Scotland should be innovative and forward looking, coordinating amongst the variety of sectors, users and instruments available—'joining the dots' to tackle the considerable challenges in educating the public and contributing to a zero waste Scotland.

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1. Introduction

The disposal of waste at sea and its accumulation on the coast is not a new occurrence. However, the on-going shift towards the use of more durable materials with increased residence time, and an increasing interest in the protection of the seas, is pushing marine litter up the political and public agenda. Combined with high profile reports such as incidences of oceanic garbage patches [1], there is an augmented international drive to address the problem of marine litter.

Marine litter can be defined as manufactured or processed solid material disposed of, or abandoned, either directly or indirectly, in the marine and coastal environment. The majority consists of plastics, and is highly persistent, often remaining in the environment for centuries [2]. Marine litter originates from both land- and sea-based activities. Land based sources include rivers [3,4], sewerage overflows [5], fly-tipping, wind-blown waste, industry [6], poor municipal waste management, as well as litter left by beachgoers [5]. Marine sources include both commercial and recreational fisheries [7] and shipping [3,8,9].

At the global scale, it has been estimated that the greatest proportion of marine litter is from land-based sources, with similar proportions at the UK level. In the UK, the Marine

Conservation Society [10] highlighted from their annual beach clean surveys that 47% was from land based sources, 17% from fishing and shipping and a further 37% is non-sourced (where due to the type or condition of the item, no clear source can be identified). The latest survey in Scotland revealed 37.5% of collected marine litter had originated from public sources, 29.6% non-sourced, 20.5% sewage related waste, 8.9% from the fishing industry, 1.7% from shipping, 1.6% fly-tipped and 0.2% medical waste [10].

The studies show the predominant identifiable source of marine litter is considered as 'public'. 'Public' is a diffuse source of marine litter, encompassing many sub-source types such as beach users and riverine and urban runoff. Litter in this category can include food and drink packaging and smoking related waste. Fisheries and sewage related waste are also noted for their high proportions within the surveys. Marine litter associated with fisheries and aquaculture includes nets, ropes, buoys and cages. These are often lost or released into the marine environment due to the snagging of gear on topographical features [6]. The discharge of untreated sewage due to ineffective waste treatment facilities and the use of combined sewer overflows can result in an influx of related waste (cotton bud sticks, nappies, sanitary products) into coastal waters [6]. Lesser quantities of litter are recorded from offshore activities and shipping, including accidental loss due to adverse weather; the contents of approximately 10,000 cargo containers are lost worldwide each year in this way [6]. The ability however, to identify a particular source or

* Corresponding author. Tel.: +44 1224 395150.

E-mail address: emily.hastings@hutton.ac.uk (E. Hastings).

industry from an individual litter item is difficult, depending on the state of the litter item (weathering) or the possibility of multiple sources.

There is a plethora of international, European and regional law pertaining to the wider principles of sustainability and water quality. Examples of these include the London Dumping Convention 1972; Bathing Water Directive 1976; the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 Annex V 1988/1991; the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) 1992; and Port Reception Facilities Directive 2000. Increasingly however, regulatory requirements on meeting environmental quality are accounting specifically for marine litter. The most recent of these is the EU Marine Strategy Framework Directive (MSFD), an integrated policy for the protection of the marine environment [11]. The directive aims to address multiple threats such as climate change, biodiversity loss, introduction of alien species and pollution from land and ocean sources.

Like all 'wicked problems', marine litter is not an easy one to solve. It can be considered a classical trans-boundary governance problem as it crosses scales, sectors and social divisions [12]. It is a problem characterised by myriad drivers, from individual responsibility to industry actions, from land and at sea. Litter comes from a number of different sources and poses problems across the economy, environment and society. There is no quick fix or easy solution, and this dynamic is one that has previously undermined a successful policy response in the UK.

The Scottish Government has recently initiated a process to advance a marine litter strategy as part of its response to the MSFD. The wide spread and multi-actor nature of the marine litter problem highlights that any policy response should incorporate environmental policy integration principles at its core to address the multiple drivers. While the Scottish strategy is in its infancy, progress has been made in determining the extent of the problem and how a marine litter strategy could coordinate, and integrate, across a range of international, UK, and Scottish policy contexts. This paper firstly summarises the key impacts upon the environment, society and economy and highlights the extent of the problem in Scotland. Secondly, the paper draws upon the literature of environmental policy integration to identify opportunities and obstacles in the emerging policy response focused at delivery in the Scottish context. It specifically aims to illuminate the challenges inherent in delivering an integrated approach to reducing marine litter that affects many sectors across national jurisdictions, using data from a stakeholder workshop.

2. Impacts and extent of marine litter

The value of the maritime economy to Scotland is significant. In 2008 the core marine sectors contributed nearly £3.6 billion (Gross Value Added), and a further £13.3 billion for oil and gas extraction [13]. Nevertheless, policy governing the marine environment and its protection falls under the remit of many bodies, and frequently no clear mechanisms exist for problems crossing multiple jurisdictions such as marine litter. Recognising the negative impacts of this situation and of marine litter is a first step in developing effective policy measures.

The problems and threats arising both directly and indirectly from marine litter are extensive, and well documented [2,14–17], including environmental, social and economic impacts. These impacts are diverse, usually interconnected and thus harder to mitigate as separate entities. Detrimental effects on marine life typically include entanglement [9,18] and ingestion [19] reducing quality of life, decreasing reproductive capability and ultimately leading to death. Less emotive impacts include the potential for

marine litter to act as a vector for non-native species [20,21], damage to benthic habitats via smothering and anoxic conditions [2,22], as well as wider ecosystem deterioration. The pressures of marine litter add to other anthropological stressors in the marine environment, such as over-fishing, coastal development, ocean acidification and pollution events [2]. This amalgamation may combine to cause extensive ecosystem deterioration, and reduce the ecosystem's capacity to withstand large perturbations in the environment, such as the impacts of climate change.

Furthermore, marine litter can have wide spread social impacts such as direct, short-term human health issues (e.g. injuries, entanglement and navigational hazards) and indirect, long-term impacts on quality of life (e.g. diminishing recreational opportunities, loss of aesthetic value and loss of non-use value) [22]. Despite the extensive impacts, the overall understanding of these are limited, particularly the indirect and socio-economic effects. There are incomplete data on the overall influence of marine litter on society. It is clear, however, that there is an abundance of economic impacts upon the raft of industries reliant on our coastal and marine environment [6]. Of these, those with direct economic impacts are the most obvious, from the expense to local authorities responsible for clean-up activities, and the impacts on tourism, to the loss of vessel activity as a result of propeller or fishing net fouling.

Figures from the literature provide a picture of the considerable economic impacts of marine litter. In a study focused on Scotland by Mouat et al. [6], fisheries were found to have sustained economic impacts of £10 million/annum. Impacts on aquaculture from litter were valued at more than £130,000/annum. Data for other sectors such as oil and gas, agriculture, recreational angling, sailing and tourism are not readily available, making the full economic cost of the impacts complex. While economic costing of ecosystem services is considered a relatively new science, it is clear that litter can impact and deteriorate a range of natural functions that provide on-going social and economic benefits. A study found that 85% of tourists and residents would not visit a beach with more than two litter items per metre and 97% would not go to a beach with 10 or more large items of litter per metre [23]. This could have significant impacts on the geography of tourism, and on areas where tourism forms the mainstay of the local economy.

It is apparent therefore, at the level of the individual, that the costs associated with marine litter are often borne by parties different from those causing the problem. There is insufficient liability to those responsible, and a lack of incentives to reduce littering practice. Expressed differently—the polluter, whether it is sectors or individuals, does not pay. This is compounded by a lack of enforcement mechanisms and actions. Adding to this complexity is the fact that marine litter comes from a diverse array of sources—from land and sea, from individuals, communities, and industries across a variety of spatial scales. The resolution of these problems requires considerable policy innovation and the use of a portfolio of traditional command and control instruments, market based instruments, education and awareness raising initiatives. Indeed, marine litter can be construed as a 'wicked problem' where no clear solution can be found to a problem that crosses scales and interests. Addressing it therefore requires investment in long term social change and policy innovation across jurisdictions.

Monitoring is often seen as integral to solving the marine litter issue; without it there would be little indication of which policy interventions are having an impact. Baseline data for Scotland are limited mostly to coastal surveys of beached marine litter. Marine Conservation Society (MCS) data show in 2011, a total of 21,888 items of litter were collected on selected Scottish beaches and offer insights to the originating source [10].

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